EFFECTS OF STUDENT AND SCHOOL RELATED FACTORS ON THE MATHEMATICS ACHIEVEMENT IN TURKEY AT EIGHT GRADE LEVEL

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ABSTRACT

EFFECTS OF STUDENT AND SCHOOL RELATED FACTORS ON THE MATHEMATICS ACHIEVEMENT IN TURKEY AT EIGHT GRADE LEVEL

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The purpose of the study is to investigate how well the mathematics achievement is explained by the students and school related factors. Also, to what extent students and school related factors components are accounted for students' mathematics achievement in answering reasoning level questions and basic mathematical knowledge questions will be investigated. This study will basically combine students' questionnaires items with their mathematics achievement scores obtained from mathematics achievement tests items.

According to content and cognitive domains three achievement tests were prepared from TIMSS-2003 released mathematic items. Student questionnaire consist of combination of items from TIMSS-2003 and TMSS-1999 student questionnaires. The seventy six items selected from the students questionnaires were analyzed using principle component factor analysis and ten interpretable dimensions were found. Based on the result of the factor analysis, variables were generated by selecting the observed variables with highest loadings. These variables were: socio-economic status, perception of success, teacher centered activities, students centered activities, out of school activities, out of school activities II, school climate, reason for being successful in mathematics, homework and computer. The data which is used in the study gathered from four socially and economically different schools in

Ankara and the final sample of the study consisted of 426 elementary school students. This data was analyzed by using regression analysis.

Regression analysis results indicated that socio-economic status was the strongest factor explaining mathematics achievement. Other important variables were the perception of success, use of computers and homework activities. Socio-economic status and perception of success have positive relationships with mathematics achievement, while homework and computer have negative relationships. These four variables account for the 30.1 % of the variance in mathematics achievement. Other variables did not significantly contribute to mathematics achievement in the regression model. Students' achievement in basic mathematical knowledge was explained by the same variables which were socio-economic status, perception of success, homework and computer in the same way. However, achievement in reasoning level explained by socio- economic status, perception of success and homework. The use of computer factor did not contribute the achievement in reasoning level.

Keywords: Factors Affecting Mathematics Achievement, Regression Analysis, TIMSS 2003

ÖZ

TÜRKİYEDEKİ SEKİZİNCİ SINIF ÖĞRENCİLERİNİN ÖĞRENCİ VE OKULA BAĞLI ÖZELLİKLERİNİN MATEMATİK BAŞARISI İLE İLİŞKİSİ

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Bu çalışmanın amacı matematik başarısının okula bağlı olan faktörler ve öğrenciye bağlı faktörlerle ne şekilde açıklanabileceğinin belirlenmesidir. Ayrıca okula bağlı faktörler ve öğrenciye bağlı faktörlerin akıl yürütme ve temel matematiksel beceriler düzeylerindeki başarıları nasıl etkilediği de araştırılacaktır. Bu çalışmada temelde öğrencilerin matematik başarı testine verdikleri cevaplar ile öğrenci anketine verdikleri cevaplar birleştirilecektir.

TIMSS 2003 Matematik Başarı Testi'nin yayınlanan soruları ile bilişsel alan ve konu alanı temel alınarak 3 paralel form hazırlanmıştır. Öğrenci anketi ise TIMSS 2003 Öğrenci Anketi ve TIMSS 1999 Öğrenci Anketindeki soruların birleştirilmesiyle oluşturulmuştur. Öğrenci anketinden seçilen yetmiş altı soru temel bileşenler faktör çözümlenmesi kullanılarak analiz edildi ve sonuçta on yorumlanabilir boyut bulundu. En yüksek yüklü gözlenen değişkenler seçilerek faktörler oluşturuldu. Bu faktörler şunlardır; sosyo-ekonomik durum, başarı algısı, öğrenci merkezli ve öğretmen merkezli etkinlikler, okul dışı etkinlikler I okul dışı etkinlikler II, okul iklimi, matematikte başarılı olma nedenleri, ödev ve bilgisayar. Bu çalışmada kullanılan veriler Ankara'daki dört sosyal ve ekonomik durumları

farklı okulda toplandı. Örneklem 426 ilköğretim öğrencisinden oluşmaktadır. Veriler regresyon analiziyle analiz edilmiştir.

Regresyon analizinin sonucunda matematik başarısını etkileyen en önemli faktör olarak sosyo-ekonomik durum bulundu. Matematik başarısını açıklayan diğer faktörler başarı algısı, ödev ve bilgisayar olarak bulundu. Soyo-ekonomik durum ile başarı algısının matematik başarısına pozitif etkisi bulunurken ödev ve bilgisayarın negatif etkisi olduğu saptandı. Bu dört değişken matematik başarısındaki varyansın % 30.1 ini açıklamaktadır. Diğer faktörlerin regresyon modellerinde matematik başarınsa etkisi bulunamamıştır. Öğrencilerin temel matematiksel beceriler düzeyindeki başarıları da sosyo-ekonomik durum, başarı algısı, ödev ve bilgisayar faktörleriyle benzer şekilde açıklanmıştır. Akıl yürütme düzeyindeki matematik başarısı ise sosyo-ekonomik durum, başarı algısı ve ödev faktörleriyle açıklanmıştır. Bilgisayarın akıl yürütme düzeyindeki matematik başarısına bir etkisi bulunamamıştır.

Anahtar Kelimeler: Matematik Başarısını Etkileyen Faktörler, TIMSS 2003, Regresyon Analizi

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVATIONS

PERSUCC	:	Perception of success
STUACT	:	Students centered activities
TEACACT	:	Teacher centered activities
OUTOFSCH I	:	Out of School Activities
SES	:	Socio-economic status
OUTOFSCH II	:	Out of school activities
BULLYING	:	School climate
SUCCESS	:	Reason for mathematics success
ACHV	:	Mathematics Achievement
TIMSS	:	Trends in International Mathematics and Science Study

CHAPTER 1

INTRODUCTION

1.1 Mathematics Achievement

Intense global competition and the rapid technological change in output and global markets require a country to have an educated and adoptable workforce. Moreover, economic growth is related to human capital stock of country's workforce (Aksoy & Link, 2000). National policy leaders understand the importance of students' mathematics success for the growth of the economy (Wang, 2004). Achievement in mathematics is considered a substantial element in decisions concerning placement, selection, and admission in most educational system at all levels (Birenbaum, Curtis, Tatsuoka, and Xin, 2005). Society expects learning to result from education as an institution and from the school as an organization, but in fact the results of education are achieved in classrooms where other influences on the learning of the students and results of their education are found (Fisher & Webster, 2000). Education is a complex process with many variables interacting in a way that affects learning actually take place (Papanastasiou, 2000b). Researchers concern the factors that influence achievement by investigating how they affect the achievement. So, lots of studies were conducted to find out influential factors of achievement and their impacts on it. Students home background, parents educational level, home possessions, students attitudes, self- beliefs, homework, instructional activities, computers are some of the influential factors of the education and also mathematics achievement.

Since students home background factors like parents' educational level, family type cultural resources and the society in which they live have impacts on the students' personnel growth and academic success (Wang, 2004). A number of researches have been conducted on socio- economic status and its effect on mathematics achievement. And positive impact of socio-economic status on

students' mathematics achievement has been found in many studies (Wöbmann, 2005; Boss & Kuipier, 1999; Beaton & O'Dewyer, 2002; Wang, 2004; Tağ, 2000; Yayan & Berberoğlu, 2004; Yang 2003).

Another important factor that affects the mathematics achievement is the students' perception of success. Perception of success factor in this study has some components according to literature. One of them is the students' perception of academic failure. In their study Yayan & Berberoğlu (2004) found it as to be the most influential factor on mathematics achievement. Another component is the self-concept, which is belief about having ability to do well in mathematics (House,2004; Hommouri 2004; Wilkins, 2004; Tağ, 2000; Greenwood, 1997) , has also positive effect on mathematics achievement. And also there is a positive relationship between attitude which defined liking and enjoying mathematics by Ma (1997) Webster and Fisher (2000), Wöbmann (2005), Papanastasiou E, (2002), and mathematics achievement. Although the common belief is that there is a positive relationship between attitude towards mathematics and achievement in mathematics Papanastasiou could not find such a relationship in his both studies which conducted 2000a and another conducted 2002a. All of these variables which have different names in the literature are taken under the perception of success variable in the study.

Homework is one of the most frequently used instruments by the teachers so researchers also consider its affect on mathematics achievement. Jaan (2006) could not find relationships between homework and mathematics achievement even he found negative effects on TIMSS 2003 results. But frequency of homework has an positive impact on mathematics achievement (Ma, 1997; Trautwein, Köller,Schmitz, and Baumert, 2002; 2006; Revak, 1997; House, 2004). However, typical homework assignments have no positive effect on mathematics achievement in the study conducted by Trautwein et. al. (2002).

As a result of rapid growth of technology the numbers of computer users have increased. And also it becomes to be an instrument for education both in school and at home. Research results show that students mostly use computer for games and for school they use it in word processing (Lewin, 2004 and Harris, 1999). Most frequent use of communication and information technologies for mathematics lessons has negative effect on students' mathematics achievement. (Pelgrum & Plomp, 2002; Papanastasiou , 2002c).

Watching television, spending more time with their friends and engaging in sports have negative effects on mathematics achievement (Yayan & Berberoğlu, 2004,Wang, 2004; Birenbaum et. al, 2005). And also students' carrier plans, students' characteristics, and school and region are significant predictors of the mathematics achievement (Ma, 1997).

1.2 Trends in International Mathematics and Science Study (TIMSS)

Globalization of markets and factors such as knowledge exacerbate the competition between countries who have enormous advantage in a faster paced world economy and who are less well prepared. So, demand has emerged for the regular monitoring of educational quality (Wagemaker, 2002). 'Educational policy is formulated and implemented at all level of the education system even where system-level constrains such as centralized curriculum restrict what schools and teacher might do. Discretion at the school and classroom levels always remains. How and on what basis policy makers, administrators, and teachers make decisions in the educational arena is at the heart of international comparative studies like TIMSS (Wagemaker, 2002)'. TIMSS 2003 is the most in a very ambitious series of international assessments conducted in nearly 50 countries to measure trends in mathematics and science learning. By providing data about students achievement in relation to different types of curricula, instructional practice and school environments TIMSS aims to improve teaching and learning of mathematics and science (Mullis, Martin, Gonzalez, & Chrostowski, 2004).

TIMSS is a project of The International Association for the Evaluation of Educational Achievement (IEA) (Mullis, et. al., 2004). It is an independent international organization founded in 1959 by a group of leading educational researchers (Papanastasiou, 2000b). Conducted first 1995 and then 1999 in a regular four year cycle of TIMSS provides countries with an unprecedented opportunity to obtain comparative information about their students' achievement in mathematics and science (Mullis, et. al., 2004). More importantly TIMSS also collects a rich array of contextual information about how mathematics and science study take places in each country by asking students their teachers and their school principles to complete questionnaires about the curriculum, schools, and instruction (Mullis, et. al., 2004). And also this data gives policy makers, curriculum specialists and researchers a

dynamic picture of implementation of educational policies and practices around the world by providing an invaluable perspective (Mullis, et. al., 2004).

'The overall aim of TIMSS was to contribute to improvement of the teaching and learning of mathematics and science in K-12 educational system around the world. The intention was that policy makers, researcher, curriculum developers and educators at all levels could use TIMSS data and findings to learn about the kinds of curriculum and instructional practices that is associated with highest level of achievement. In other words, educators from different national and cultural background could use the result of the study as a kind of mirror in which to study themselves, but not in isolation instead. TIMSS provided a unique opportunity for them to view themselves in the rich context provided by the participation of the many other countries (Robitaille & Beaton, 2002)'.

1.3 Aim of the Study

In TIMSS 1999 Turkey's achievement was quite low. According to results of Turkey's TIMSS 1999 National Reports following results were found. Turkey scored 31 out of 38 countries in mathematics. Only 1% of the Turkish students could arrange given data, made generalization and explained non routine problem solving strategies. 7 % of the Turkish students could apply their knowledge and understandings in relatively complex situations, 27 % of the students could apply their knowledge to simple and routine situations and lastly 65 % of the students could make simple calculations with numbers. One of the most influential factors that affect mathematics achievement is perception of failure in the report. Students feelings about their incompetence in mathematics and also beliefs about mathematics is not an easy subject decrease mathematics achievement. Another important finding is that there is a positive relationship between socio-economic status and mathematics achievement. One of the interesting finding is that there is a negative relationship between students centered activities and mathematics achievement. Increase in out of school activities decreases mathematics achievement. If the students are more quite and obedient, they are less successful in mathematics. Increase of socio-economic status, teacher centered activities, and importance given to mathematics positively affect perception of success. When frequency of teacher centered activities and importance given to mathematics increases, students

perception of failure decreases for students with high socio-economic status. Increase of socio-economic status weakly increases the importance given to mathematics. In addition increase of frequency of teacher centered activities increases the importance given to mathematics. In contrast student centered activities and out of school activities have negative relationships with importance given to mathematics. But classroom climate do not have an effect on the importance given to mathematics.

Turkey did not participate in the TIMSS 2003 study. Thus, Turkey missed the opportunity to pursue the trend information about student process in science and mathematics achievement. For this reason, in this study it is aimed to conduct a pilot study to administer the TIMSS achievement test questions and student questionnaire at various schools. Based on the mathematics achievement test questions, and student questionnaire of the TIMSS 1999 and TIMSS 2003 studies, data were collected at 361 8^{th} graders and 61 7^{th} graders to study the important factors on mathematics achievement of the students.

1.4 Problem of the Study

Previously conducted studies with TIMSS data achievement explained various factors. Some of these are: Perception of success (Yayan & Berberoğlu, 2004; Hommouri, 2004; House, 2006), students centered instructional activities (Yayan & Berberoğlu, 2004), teacher centered instructional activities(Yayan & Berberoğlu, 2004), out of school activities(Wang, 2004), socio economics status (Boss & Kuiper, 1999; Papanastasiou 2002b; Yang, 2003; Marks, 2006), school climate (Boss & Kuiper, 1999), computer (Pelgrum & Plomp, 2002), reasons for mathematics success (Kifer, 2002), and homework (Jaan, 2006).

In this study all of these variables are used to explain mathematics achievement. So the research question of the study is 'What proportion of variance in mathematics achievement is explained by student and school related factors?'

Different from other studies achievement was taken in two dimensions which were reasoning vs. basic mathematical knowledge in the present study.

1.5 Significance of the Study

Education is an important matter for a country's development. In schools children tried to be prepared for their future lives to be given basic knowledge and

skills they will be need in their lives and professional carriers. Mathematics is the one of the major subjects for students' personnel and professional development. Most people are aware of this but most of them also believe that mathematics can be accomplished by high ability pupils. In Turkey mathematics achievement is quite low as an evidence by the TIMSS. This study is a replica of the similar studies. In the situation of the result of this study is parallel to the result of the previous studies a new evidence for previously conducted suggestion will be acquired.

1.6 Definition of Important Terms

The description of variables included in the study is given as fallows;

1. Perception of success (PERSUC): Perception of success can be regarded as students' perception of difficulty level (Yayan, 2003). Students belief to his or her ability in doing well, which named self beliefs by House (2004) and also named mathematical self concept by Wilkins (2004) in mathematics and Papanastasiou, (2002c) and Hommouri (2004) defined liking and enjoying mathematics as a mathematics attitudes. Hommouri (2004) also defined perception of difficulty level as confidance in mathematics. In the literature there are different alternatives to name observed variables of perception of success. There are 16 observed variables which are: a) I am usually successful in mathematics , b) How much do you like mathematics, c) Nobody can be good in every subject and, d) I am just not talented in mathematics, e) I enjoy learning mathematics, f) I am usually good at mathematics, g)I enjoy learning mathematics, h) I would like to mathematics much more if it were not so difficult, i) I learn things quickly in mathematics, j) Mathematics is an easy subject, k)Mathematics is boring, l)Mathematics is more difficult for me than from many of my classmates, m) Mathematics is not one of my strengths, n) I would like a job that involved using mathematics, p)Sometimes, r) when I do not understand a new topic in mathematics initially, s) I know that I will never really understand it, t) I would like to take more mathematics in school.
2. Students centered activities (STUACT): This variable is defined by 14 observed variables in the study which reflects students' perception of a more student oriented instructional activities used in mathematics classroom.

(Yayan, 2003). These observed variables are: a) We have a quiz or test, b) we work from worksheets or test book our own when we begin a new topic in mathematics, c) we begin by working together in pairs or small groups on problem or projects, d) we work on mathematics projects, e) when we begin a new topic in mathematics, f) we begin by discussing problem related to daily life, g) we work together in pairs or small group, h) we use a calculator, i) we use computer, j) the teacher uses overhead, k) we use event from daily life while solving problems in mathematics, l) when we begin a new topic in mathematics, m) we begin by having the teacher ask what we know related to new topic, n) we work problems own our own, p) when we begin a new topic in mathematics, r) we begin by trying to solve an example about new topic.

3. Teacher centered activities (TEACACT): This variable is defined by 8 observed variables in the study which reflects students' perception of a more teacher oriented instructional activities used in mathematics classrooms (Yayan, 2003). These observed variables are: a) We listen to teacher give a lecture-style presentation, b) we copy notes from the board, c) the teacher show us how to do mathematics problems, d) the teacher uses board, e) the teacher checks our homework, f) the teacher gives us homework, g) when we begin a new topic in mathematics, h) we begin by having the teachers explain the rules and the definitions, i) in a mathematics lessons students do exactly what their teachers say.
4. Out of School Activities (OUTOFSCH) : Students spends time to do lots of activities such as watching television, playing sports, playing computer games and, playing or talking with friends outside of school.
5. Socio-economic status (SES): This variable defined mostly by the education level of parents and home possessions from student background data such as books at home for both individual and school level (Yang, 2003). In the study this variable is measured by these observed variables: a) How far in school did your mother go? b) How far in school did your father go? c) I use a computer at home, d) About how many books are there in your home? e) How far in school do you expect to go? f) Do you have study desk/ table for your use at your home? g) And Doing jobs at home.

6. Out of school activities II (OUTOFSCH II): a) Students time spent go to museum or art exhibition, b) join a concert, c) go to theatre, and d) go to cinema are defined as out of school activities in the study.
7. School climate (BULLYING): This variable measured by the observed variables are: a) In school something of mine was stolen last month, b) in school, I think other students hurt me, c) in school, last month, some of my friends miss the lessons, d) in school, last month some of my friends things was stolen, e) in schools, last month other students hurt some of my friends, in school, f) I was hit or hurt by other student(s)(e.g. shoving, hitting, kicking) last month, g) in school last month, I was made fun or called names, h) in school last month, I was left out of activities by other students' in the study.
8. Computer (COMPUTER): Students use computers because of lots of reasons especially for their leisure time activities and study for school. In the study this variable is defined by observed variables which are: a) I look up ideas and information for mathematics with a computer, b) I look up ideas and information for science with a computer, c) I process and analyze data.
9. Reason for mathematics success (SUCCESS): There are lots of reasons about why a student needs to be successful in mathematics. In the study this variable is measured by a) I need to be successful in mathematics to get the job I want, b) I need to be successful in mathematics to make my family happy, c) I need to be successful in mathematics to get in to the university or secondary school of my choice, d) I need to be successful in mathematics to make me happy.
10. Homework (HOMEWORK): This variable is defined by three observed variables which are: a) We check each other's homework, b) we discuss our completed homework, c) we review our homework.
11. Observed variables: Observed variables are the variables which are directly measurable or observable (Schumacker & Lomax, 1996, p.77).

CHAPTER 2

LITERATURE REVIEW

Mathematics achievement could be attributed to complex and dynamic interaction among cognitive, affective and motivational variables such as students' ability, attitudes and perceptions, socio economic variables, parent and peer influences, school related variables, and so on (Hammouri, 2004). Thus, understanding the role of such variables in mathematics achievement has attracted serious attention in recent years (Hammouri, 2004). In this chapter studies conducted about some of variables which influence mathematics achievement and investigated in the present study was introduced.

2.1 Socio Economic Status

More attention is being given to education, because education is the key element for stable and prosperous future (Ma, 1997). Also one of the influencing factors in education is the socio-economic status. The role of socio economic status (SES) in determining student's school performance has always been an area of considerable attention in the sociology of education (Yang, 2003). Characteristics of student, family, school and region which have important influence on academic achievement have been identified in the research literature (Ma, 1997).

Family background factors such as presence of study aids at home and students' allocation of extra curricular time are connected closely with at-home behaviors that encourage learning and schooling (Wang, 2004). When parents participate in decision making e.g. development, implementation of certain educational programs and strategies for reinforcement at home, they are more motivated to cooperate with school and pay attention to their child's academic progress; so, these strategies in turn lead to improve achievement (Wang, 2004).

It should be noted that information about parents' education, occupation, and income obtained from young children is often unreliable (Yang, 2003). Thus, alternative SES measures are required. A set of possession variables from students' background data, such as books at home, house, car, dishwasher, and the like apply to measure at both individual and school level (Yang, 2003).

Wöbmann (2005) reported that as a result of detailed descriptive statistics and discussion on the data on students and family background; all East Asian countries students, who have more favorable family background, perform consistently better in all countries. Family background were measured by the highest level of education achieved by parents and number of books in the students' home. The explanatory power of the family background regression (the R^2) ranges from 10.2 % to 16.9% in these countries (without considering the variation explained by the imputation controls).

And also Boss & Kuiper (1999) have found that home educational background which measured by number of books at home and parent's educational level have significant direct effect on mathematics achievement. Greenwood (1997) investigated the influence of different student characteristics (including self-efficacy, attitudes, and perceptions of the importance of mathematics) on achievement in mathematics. Home background variables were also investigated. The technique of Partial Least Squares Path Analysis was used to analyze the data from the Australian Population 2 (thirteen year olds), collected during the Third International Mathematics and Science Study. Self-efficacy and home background were found to have the greatest influence on mathematics achievement. The model shows that students coming from a more economically and educationally advantaged background are more likely to do better in mathematics.

Using a structural equation model Papanastasiou (2002b) explored how mathematics outcomes are stimulated by predictors related to family and schools. Higher grade of population 2 data from TIMSS were used in the study. The strongest direct influence on attitudes towards mathematics was teaching, and it was followed by reinforcement of the students from their near surroundings. The weakest effect was exerted by the educational background of the family. The strongest direct effect on students' belief about mathematics was exerted by the reinforcement given by mothers, and friends, and it was followed by the educational background of the

family. The climate of the school is most directly influenced by SES followed by educational background. Educational background and students reinforcements of the family define a second order factor structure which includes endogenous predictors, SES of the family, students' attitudes toward mathematics, belief regarding success in mathematics, the kind of teaching and school climate. These results indicate that the problem of mathematics achievement is multidimensional.

Similarly, Yang (2003) applying two level structural equation modeling techniques examined the dimensionality of socio-economic status (SES) and its relationship with mathematics and science performance at student and school levels. Data have drawn from 17 countries in the Third International Mathematics and Science Study (TIMSS). The number of books at home and father's education level were selected to measure SES. A general capita dimension and cultural capita dimension were identified at the student level for most of the countries. At the school level a general socio-demographic factor, along with a cultural environment factor in a few countries, accounts for the covariance of the school level means of the SES indicators. In almost all countries the number of books at home variable is highly related to the cultural capital factor and other cultural indicators has also sizeable factor loadings on the cultural capital factors. But these cultural indicators relate lowly to the general economic capital factor. The cultural resource factor has great influence on Math/Science Achievement at both student and school levels. On average it explains over 35% of the differences in school. Social background which reflects community socio-demographic characteristics is highly related to Math/Science achievement but this varies across the countries. The general socio-demographic characteristics of the community have less affect but the cultural resources and climate at school have great importance on school Math/Science achievement in the countries where it is possible to identify the cultural capital dimension of the community.

Ma (1997) using the high school senior students' data which were collected during the 1988-1989 school year in the Dominic Republic examined given the hierarchical, sociological context the relationship between mathematics achievement to characteristic of student, family, school and region. Multiple regression model was used to examine the data. Independent variables were classified into different sets: the set of students characteristics including gender, age, and the number of brothers

and sisters; the set of parental education level, including father's and mother's educational levels; the set of school type; the type of school characteristics, including frequency of homework, daily time for homework and provision of textbook; the set of attitude towards mathematics; the set of desire for future carrier; the set of geographic characteristics. This study showed that mother's education level was not statistically significant in explaining students' mathematics achievement but in contrast father's educational level accounted for a significant amount of variance. Students' career plans were the only non-significant predictor in the study. But the set of students' characteristics did continue to be the most important predictor set for mathematics achievement. School and region also seem to have important functions in the hierarchical sociological context, being significant predictors for mathematics achievement. Lastly, students having fewer sisters and brothers had better mathematic achievement.

Marks (2006) cross nationally compared the effects of family size and family type on student achievement and he examined the extent that these effects can be accounted for by socio economic background, resource in the home and school factors. The data is from OECD 2000 Program for International, Student Assessment (PISA) study that examined students' achievement in reading, mathematics and science across 32 countries. Achievement is the independent variable and the effects of family type and family size are regression coefficients. The number of siblings has negative and significant effects on mathematics achievements. The influence of the material and social resources on the effects of family size is not closely associated. But students' distribution across schools and students' academic location within schools produce decline on achievement. Tracked school systems decrease students' academic achievement. Students who live with both parents are more successful than students from single parent, reconstituted or other type of families and socio economic background's effect on achievement have less impact on students who lives both parents. But additional resources have substantial effect on single parent family students' achievement. Differences in wealth and educational resources have more impact on single parent family student's lower score than socio-economic status. Lower scored students who have single parents more affected from material factors than students who have reconstituted family. The effect of single parent families was weak after controlling socio-economic status and resources. The effect

of reconstituted family especially in countries with track school system sensationally reduced in controlling by academic location.

Schiller, Khmelkov and Wang (2002) examined 'How the effect of two social background indicators – parents' education and family structure- are associated with nation levels of economic development on mathematics achievement.' To do this ordinary least square (OLS) regression models were used for the same independent and control variables for each nations and hierarchal linear modeling (HLM) were conducted to estimate interaction effects between individual levels and nation level factors. The final sample used in this analysis was 219,402 students, with an average of 6,453 per nations. Researchers focus on the analysis of the international variation in the relationship between mathematics achievement and adolescents' social background which are related to nation levels of economic development. The measure of economic development was the per capita gross domestic product (GDP) 1998 CD-ROM published by the World Bank. Although same nations have similar economic development they vary demographically, culturally and politically which also affects the relationship between adolescents' social background and academic achievement. To partially control these differences in HLM a classification schema was developed. The schema was European, Scandinavian, Immigrant, Mediterranean, Baltic/Central European Eastern European, Industrialized Asian Pacific, Non-industrialized Southern Asian Pacific. Mathematic achievement was the dependent variable, family structure (based on adolescents reports of the adults living in their household), and parents' education were independent variables. Adolescents' academic ability reflected in their relative educational progress, orientation toward schooling and mathematics, students' attitudes towards mathematics which based on their reports of the number of hours they spent each day outside of the school and how much they like the subject and gender taken as control variables to reduce the unexplained variation in mathematics test scores. Two sets of analysis were conducted. Using the same OLS regression model separately for each of the 34 nations, the effects of parents' education and family structure differences across nations was explored in the first set of analysis and using HLM differences in the coefficients for these family background variables was modeled statistically. Parents' education and living in traditional families were positively related to mathematics achievement in these 34 nations participating TIMSS. However, between national

level of economic developments and parents' education levels' effect on mathematics achievement have no discernable pattern across nations. But in contrast, the effect of family structure was significantly stronger in nations with higher GDPs according to both OLS regression analysis and HML results. Living in a nontraditional family, regardless of the type, was more disadvantageous in more affluent countries.

Beaton and O'Dewyer (2002) tried to explore the ways in which students were grouped into classrooms in the countries that participating in TIMSS 1999. And also variance components and SES indicators were investigated in the study. The data analysis for this research was involved in partitioning the eight graders mathematics achievement variance using three different models:

• an unconditional model that uses no information except the first mathematics plausible value and the identification of a students' school and classroom;

• a model that partitions the unconditional variance components into components associated with commonly used SES variables;

• an expanded model that partitions the unconditional variance further using SES data, information about academic press, attitudes towards mathematics learning, and classroom climate.

The variables used in this model displayed in four categories:

▪ SES indicators (parents education, presence of parents in the home, possession in the home, number of books in the home, number of people living in the home, and out of school work time)

▪ Academic Pressure Indicators (maternal pressure, self pressure, pear pressure)

▪ Students Attitudes Towards Mathematics Learning Indicators (liking for mathematics, perceived importance of mathematics)

▪ Mathematics Classroom Climate Indicators (mathematics classroom climate).

The HLM software of Bryk, Raudenbush, and Congdom (1992) were used in analyzing data. In all 41 countries the correlation between standard deviations and means is 0. 71. This means that there were quite a few students who did not perform well on TIMSS mathematics achievement test in high scoring countries. The small

standard deviations for low scoring countries mean that the test was too difficult even for better students and was not an optimum measuring instrument for them. The unconditional among school variance is very small in Sweden (1.49 percent) and it indicates the average mathematics scores are about the same in the various schools in the country and they are highest in Hong Kong (39.69 percent). The unconditional between classroom variance is amazingly small in Korea (0.23 percent) indicating conscious effort to equalize the performance of the classrooms; and the largest are in the United States (36.25 percent). Unlike this the only country that has within classroom variance below the 50 percent is United States which means that the more homogenous the students in the classrooms. In Korea, Cyprus, and Slovenia this variance is above the 90 percents. In TIMSS countries, the correlation between the mean mathematics score and average tracking index, which shows how students within a school actually distributed, is less then 0.10 but this small correlation does not support tracking actually hurts the low performing students in addition it doesn't suggest tracking really to help these students. Total school variance in mathematics performance with SES is less then 0.10 in the Korea, Slovak Republic, Cyprus, and Canada and the association is higher in United States (35 percent), Chez Republic (28 percent), Hong Kong (25 percent) trailing somewhat is behind. Despite of SES indicators to some degree with the among-school variance in all countries, the range of associated variance is startling. Slovak Republic has the lowest percent of the mathematics variance associated with SES, in contrast Czech Republic has the highest with over 0.99 percent. But, in both countries the amount of among school variance was small, so the 99 percent is a large part of a very small variance. The percentage of the between classroom variance associated with SES ranges from in Latvia with 0 percent and over 60 percent in United States and Cyprus. The high percentages indicate that even within schools, mathematics classrooms are somewhat homogenous in terms of SES. And lastly, all in all, the SES indicators do not explain much of the within classroom variance. But it explains 75% of the among school variance.

Wang (2004) using Third International Mathematics and Science Study TIMSS 1999 data compares students from Hong Kong with students from US on the mathematics achievement and on a series of family background factors. Three kinds of analysis were used in the study. First independent t test in SPSS was performed to

compare Hong Kong and US difference in mathematics, as well as in the family background indicators. Second, multiple regression analyses were conducted to determine these family background indicators and mathematics achievement both for Hong Kong and US. And lastly, multiple regression post hoc analyses were performed to determine whether these variables are related to Hong Kong and US mathematics achievement in the same way. Although Hong Kong and US students had equal number of advantages in home environmental factors, Hong Kong seventh and eight grade students score significantly higher than US seventh and eight grade students in mathematics achievement. The results of regression analysis show that family background indicators are significantly related to mathematics achievement for both Hong Kong and US students. Home environment factors showed similar patterns of relationships for both countries. Higher expectation of mothers from the students to do well in school and to go into high- achieving classes, strong presence of study aids, more books at home, and living with their birth parents did benefit the mathematics achievement of students regardless of the country. Living with grand parents has negative effect on achievement for US students but not for Hong Kong students. High parental education was important as a factor for US but not for Hong Kong students' success in mathematics.

Webster and Fisher (2000) examined student achievement in mathematics and science in rural and urban schools in Australia. The degree of equality of opportunity for students in rural schools was assessed by multi level modeling. TIMSS data were used for the analysis. Bivariate relation between school location and the composite variables used in the analysis and the values and statistical significant were reported. LISREL was used to examine the causal interdependency between the variables of interest in this evaluation. The results indicate that students in rural schools have statistically significant difference in achievement to those students in urban schools. However, multilevel analysis results show that there is no negative and strong effect of the availability of resources in schools on student achievement in mathematics and science, regardless of location.

2.2 Perception of Success

Because of the middle grade students' completion and negotiation of future trajectories a serious examination of factors affecting mathematics achievement is

critical in these years (Hammouri, 2004). So many studies were conducted about students' perception of success and failure and their effect on mathematics achievement.

Positive relationship between mathematics achievement and attitude towards mathematics was found by Ma (1997), Boss and Kuiper (1999), Papanastasiou, (2002c), Wöbmann (2005). In addition Greenwood (1997) found that students with more positive attitudes towards mathematics are more likely to have higher self-efficacy and perform better in mathematics than students with negative attitudes and lower self-efficacy. But no significant direct relationship was found between attitude and mathematics achievement.

Perception of failure in mathematics was found the most important latent variable in predicting Turkish students mathematics achievement in the study which conducted by Yayan and Berbroğlu (2004).

In their studies Webster and Fisher (2000) found strong significant effect of attitude on mathematics achievement. They also concluded that students' career aspiration has significant and positive effect on mathematics achievement. However, Papanastasiou (2002b) explored predictors of mathematics outcomes' focusing on variables that are related to school, family and students. Using higher grade of population 2 data from TIMSS-1999 he conducted another research in 2000a to find out predictors of attitudes and beliefs related to school and family. So he examined the predictors of mathematics outcomes focusing on attitudes and beliefs by using TIMSS- 95 data. The relationship between mathematics achievement and attitudes was not found.

By conducting multiple regression analysis, relationship between mathematics belief and mathematics achievement of students in the United States and those in Japan was examined by House (2006). Data used in the study was taken from Third International Mathematics and science study (TIMSS) population I International Samples. Natural talent, good luck, hard work studying at home memorization of textbook or notes assessed the attitudes towards the school achievement. Students response 'I enjoy learning mathematics', 'mathematics is boring', and 'mathematics is an easy subject' assessed the attitude towards mathematics. Students who attributed success in mathematics at school, to hard work and studying at home were more likely to have got higher mathematics test scores

than those students do not indicate that beliefs. In both countries students who showed low mathematics test scores tended to indicate that mathematics was boring and they attributed success in mathematics at school to natural talent. And also, similar results were found about students' belief in the studies conducted by Kifer (2002) and by Hommouri (2004). And also House (2006) found that students in Japan who earned high test score tended to attribute success in mathematics at school to memorize the textbook or notes. In contrast students in United States who attribute success in mathematics at school to memorize the textbook or notes indicates low mathematics achievement

Marsh,Trautwein, Lüdtke, Köller, and Baumert (2005) conducted two studies in Germany and tried to find out relations among academic self concept, academic interest and mathematics academic achievement. They found positive effect of these variables on mathematics achievement. Similar findings were found in the study which conducted by Wilkins (2004) to investigate mathematic and science self concept from international perspective using 41 countries' TIMSS data at students level and nations level. 'I usually do well in mathematics' and 'I usually do well in science' were taken as mathematics self concepts and science self concepts. Different from the previous mentioned research by using country level aggregates of self concept and achievement, Wilkins (2004) found negative and statistically significant correlation for both mathematics and science.

Similar to pervious research, Tağ (2000) investigated reciprocal relationship between attitudes towards mathematics and mathematics achievement. The subject of the study consists of 951 9^{th} grade students in private and Anatolian Lycee in Ankara-Turkey in the 1999-2000 academic year. Eleven scales were formed to measure latent variable. The result of this study shows that a causal model exists for attitude towards mathematics and (ATM) and achievement in mathematics (AIM). Father and teacher have positive direct effect on both AIM and ATM. Reciprocal relationship was found between ATM and AIM. Mother effect on ATM is negative but, it has positive effect on AIM. Six of the seven variables, success attribution in mathematics, confidence in learning mathematics, mathematics anxiety, effectance motivation, usefulness of mathematics, and importance of mathematics, were positively and significantly loaded ATM. More confident students are associated with more positive attitudes toward mathematics and more positive attitudes toward

mathematics are associated with higher achievement in mathematics. More students believed mathematics is useful in relationship to their future education and vacation is associated with more positive attitudes toward mathematics and more positive attitudes toward mathematics associated with higher achievement in mathematics. Low mathematics anxiety contributes positive attitudes toward mathematics and positive attitude towards mathematics is associated with higher mathematics achievement. Students' attributes to their success to their ability and failure to effort and luck are associated with the more positive attitudes toward mathematics and positive attitude towards mathematics is associated with higher mathematics achievement. The more students are aware of the importance of mathematics associated with higher achievement in mathematics. The more students involved in mathematics and enjoy with mathematics is associated with the more positive attitudes toward mathematics and positive attitude towards mathematics is associated with higher mathematics achievement. Students believe that mathematics is an area of boys dominated. They developed negative attitudes toward mathematics and being more successful.

Kifer (2002) reported students views of various aspects of mathematics and science and mathematics and science learning. The results gathered by using questionnaires TIMSS-99. Self reports of the participants and difference between educational systems and also comparison between Grade 8 and Grade 4 for Population 3 mathematics and physic students have been done. In general students from Grade 8 and Grade 4 say that they like mathematics and science and enjoy learning it, and also they do not think either mathematics or science is boring but more than half of the responses believe learning mathematics and science is not easy. And the similar results were found for Population 3. But there is a substantial difference between educational systems; students in some systems give more positive responses than students in other systems. Confounded with geographic difference, highest scoring systems in TIMSS in terms of cognitive achievement such as The Czech Republic, Hong Kong, Japan, Korea, and Singapore have the most negative effects in terms of students perceiving themselves as doing well. Students all level believe that every one wants them to do well regardless of what activity they are pursuing. Reasons for doing well vary substantially across systems and questions.

Systems with highest cognitive score students are more likely to want to do well to get into a preferred school than other reasons.

Finally, Hammouri (2004) examined the significance student-level factors that influence the mathematics achievement. The factors - students' educational aspiration; confidence in ability attitude towards mathematics; self-, mothers' and friends' perception of mathematics importance; and success attribution to luck and to hard work- are those that have a direct and/or in direct effect on 8th grade students' achievement in mathematics in Jordan. The participants were 13 year old Jordanian 8th graders participated in the Third International Mathematics and Science Study (TIMSS) (population two) in 1999. He estimated latent variables with structural equation model. Mother's perception of mathematics importance, friends' perception of mathematics importance, self-perception of mathematics achievement, success attribution to hard work, success attribution to luck, educational aspiration, confidence in mathematics ability, attitude towards mathematics, and mathematic achievement were used as variables. The direct and total effects of each of the latent variables were then estimated using the LISREL program. Thus a model was estimated for mathematics achievement. He hypnotized that; only success attribution to luck has direct negative effect on mathematics achievement and other factors had direct positive effects. He found significant positive direct and total effects of: a) mothers perception of importance on mathematics achievement, attitude towards mathematics, self perception of mathematics, confidence in ability and educational aspiration; b) success attribution to hard work on mathematics achievement, attitude toward mathematics, educational aspiration, and self- and friends' perception of mathematics importance; c) attitude towards mathematics on mathematics achievement and self perception of mathematics importance; d) confidence in mathematics ability on mathematics achievement, attitude towards mathematics, educational aspiration and self- perception of mathematics importance; e) educational aspiration on mathematics achievement and attitude towards mathematics; self perception of mathematics importance on mathematics achievement; f) friends' perception of mathematics importance on attitude towards mathematics, educational aspiration and self perception of mathematics importance. He also found significant negative direct and total effects of success attribution to

luck on mathematics achievement and confidence in ability; and also friends' perception of mathematics importance on mathematics achievement.

2.3 Homework

It is overall belief that homework facilitates learning and these beliefs are supported by numerous research (Jaan, 2006). Homework has positive influence not only on students' achievement but also on their development. In general Cooper and Valentine (2001) concluded that homework develops independent learning, willpower, motivation to learn (as cited in Jaan, 2006). The influence of homework is mediated by the students' personal characteristics and the effect of homework on achievement depends on its organization and parental support. (Jaan, 2006).

Trautwein et.al. (2002) investigated the role of homework in enhancing 7^{th} grade mathematics achievement. Intelligence, SES, motivation, and type of secondary school were controlled. Students sample (n = 1976) were drawn from three federal states (one in West and two in East German) at the beginning of the 1991/1992 school year. In the study the explained variance after controlling several system and entry variables were about 8% at the class level. Frequency of homework and more daily time for homework lead to better mathematics achievement (similar finding were found by Ma, 1997). But although the frequency of giving homework as had positive effects, that enhance learning. Short assignments were proved to be at least as good as longer ones. But, a significant interaction effect indicates that the gap between low-and high achieving students decreased in classes which typically spent more time on assignment. Frequent homework assignment correlates with higher achievement gains. This indicates that students may profit from regular homework by catching up with newly acquired knowledge and procedures on daily basis or by preparing themselves for coming lessons and reviewing previous lessons. On the other hand, if typical homework assignments (indicated by the class average time typically spent on assignment) are very long, no additional positive effects are shown. Using multilevel modeling, a negative interaction of prior knowledge and typical homework length was found. Effects of this interaction indicate that low achieving students gain more than high achieving students from extensive homework assignment.

As similar previous research, Revak (1997) using the data which gathered from 375 United States Air Force Academy (USAFA) students enrolled in Precalculus during the 1995 fall semester, and also House (2004) relying on students responses on the hours of homework and using National Education Longitudinal Studies program (NELS88) also found a significant positive correlation between homework scores and mathematics exam scores. Meaningful homework may be viewed as an important component in mastering mathematics course material (Revak, 1997). Keys (1999) using TIMSS data made comparisons in terms of the results from the 13 European countries and England. Teachers and students taking part in TIMSS were asked several questions about homework. How frequently teachers set homework, how long students set doing homework, how teaches follow up homework. In the study there were positive association between measures concerned with homework and 13 years olds' performance on TIMSS mathematics and science tests in England on the other hand, an examination of the pattern across countries provided no evidence that time spent on homework by 9 year olds was an important determination of the mathematic achievement. Possibly this was because the measure used, the proportion of students who were set mathematics homework once a week or more, did not discriminate very well between countries: in 10 of the 13 countries, the majority of 9 year old students were set mathematics homework at least once a week.

Jaan (2006) examined complex relationship between homework and academic achievement by correlating 2003 TIMSS mathematics results. Data for this research was taken from the TIMSS 2003 mathematics grade 8 study was carried out 46 countries over the world. The characteristics of homework were correlated with the TIMSS results. The correlation between the teachers' emphasis on mathematics homework and TIMSS results was negative but not significant. The students of teachers with medium emphasis of homework achieved better results then students of teacher with higher emphasis on homework but the difference is small. In contras there is a statistically significant difference between students with medium emphasis teacher on homework and students with low emphasis teachers. Teachers' low emphasis on homework reduces the TIMSS results. The percent of students who assessed their time for homework high had no significant correlation with TIMSS score in inter-country comparison. The data for within country comparison reveal

that the relationship between time for mathematics homework and TIMSS results can be curvilinear. The highest average score was achieved by students who spent medium amount of time (1- 1.5 hour per week) doing mathematics well. Most teacher monitor whether the homework was completed, but monitoring had no statistically significant correlation with TIMSS results. Correcting homework always or almost always had a negative correlation with TIMSS results. The more there are teachers who use homework to contribute students' mark, the lower the TIMSS results. And using homework for class discussion has statistically significant negative correlation with TIMSS results. As a result the study reveals that homework has no relationship to academic achievement and it has even negative effect on TIMSS results.

2.4 Computer

Pelgrum and Plomp (2002) tried to find out a description of indicator related to Information and Communication Technologies (ICT) and mathematics education. The data were collected in TIMSS-95. in roughly half of the countries that participated in TIMSS-95, 50 percent or more of the students had access to computer at home. Compared with TIMSS-99 data in most countries these indicators were increasing but countries with weak economies the changes were small or even negative. The majority of students in most countries report that they have never used computer for mathematics. One of the important points is that what ICT's added value to instruction is to explore answer to this question. It is important to how technology is used in mathematics lessons and what is the characteristic of the users are. ICT was only marginally used low secondary level and this change is hardly between 1995 and 1999. The one of the interesting findings of the study is that; students who used ICT more frequently for mathematics learning had much lower achievement scores than those students who hardly use or not use it. In order to understand in what extent ICT covariate with other variables exploration was conducted and the followings were found: 'students who used computers for mathematics quite frequently did not seem to differ in terms of home background when compared with students who have never used or hardly used computer for mathematics learning', and 'frequent use of computer tended to be strongly

associated with student centered pedagogical approaches during mathematics lessons.'

In her study Papanastasiou (2002c) found similar finding the less the students use computer in their classrooms the higher their mathematics scores are, and the highest mean generally belongs to students who never used computers.

Oklun et. al. (2005) investigated possible impact of computers on Turkish fourth grade students' geometry scores and further geometric learning. A total 279 (224 fourth and 55 fifth) grade students recruited from four school sites a province in Turkey were pre tested and on the basis of their pretest score 100 students from two schools were assigned to experimental and control group. One of the schools has in low socio- economic neighborhood and other one has in middle socio-economic neighborhood. Students were divided into five equivalent homogenous groups of 20 each based on their pre test results and two of them assigned as control groups and three of them assigned as experimental groups. During the treatments students in the experimental studies solved computer based Tangram puzzles and students in control groups continue on their regular classes. The higher the SES of the school's neighborhood the more students have computers at home. These students performing better prior to any intervention. Independent t test results show significant difference between students with computer experiences versus who did not at fifth grade but not fourth grade. Students who had computer at home tend to performing better prior to any intervention and intervention with computer based Tangrams facilitate geometric learning. T test showed significant difference between experimental group and control group. Univariate analysis of variance results did not significant difference on achievement between those who had computer at home and who did not. There is no significant interaction between computer ownership and computer instruction interaction influencing students score on learning geometry.

Lewin (2004) examined the difference between home and school experience of instructional and communicational technologies (ICT) usage and formal/informal learning opportunities. The large scale project reported in this article involved qualitative and quantitative methods. A questionnaire was administered to 700 English pupils from each key stage, a total of 2100 students, at the beginning and at the end of the projects. The individual pupil log was used to monitor use of ICT at school and at home for both homework and leisure activities over a period of one

week, including a weekend. The internet questionnaire was used to monitor how and why pupils used internet at home and at school for both teacher-directed and learner-initiated activities. The pupil questionnaires provided evidence that computer ownership and internet access in the home increased but the ownership of games consoles remained unchanged. The pupil log indicates that ICT use at home is greater than at school. Of the average 10 hours of ICT home use a week, an average of 6.5 were spent on leisure activities. The most common use of ICT at home to support school work was word processing, followed by the internet, matching the common use of ICT in schools. The internet, CD-ROMs, email and chat facilities were the most popular leisure activities. Students less use computer at school because of the technical problems and limited accesses due to filtering, availability of computers and time constrain. School access incurred no personnel access but home and internet café access did. The questionnaires on internet also indicated that leisure-related web sites were more popular across the whole cohort than used to support school-related work. Similarly pupils use internet to develop their knowledge of a variety of topics related to their personnel interest.

Similar things found in the study which conducted by Haris (1999). She tried to find out secondary school English students' use of computers at home and she found that students most widely used application of computers were games/adventures and word processing. These two applications respectively present leisure-and school related activities.

2.5 Other Studies Conducted About Mathematics Achievement

Applying linear structural equation model to TIMSS Turkish data set Yayan and Berberoğlu (2004) investigated factors that are influential in explaining students' achievement in mathematics. One of the most striking results of the study is the negative relationship between so-called students centered classroom activities and mathematics achievement. And also negative relationship was found between out of school activities and mathematics achievement. But there is a positive relationship between perception of failure in mathematics and out of school activities; this means students, who watch more television, spent more time with their friends and engage in sports, they perceive more failure in mathematics. Teacher centered activities and importance given to mathematics have positive impact on mathematics achievement.

Family background characteristics and importance given to mathematics increases the confidence in mathematics. Student centered activities make classrooms non-participatory, with highly obedient and orderly students who neglect school work. Importance given to mathematics creates more quiet classrooms but it is not positive effect on mathematics achievement.

Öztürk (2003) using 752 high ability 9^{th} grade Turkish students' data and conducted multiple regression analysis. According to this results he found that intrinsic goal orientation, task value, control beliefs self efficacy, cognitive strategy use and self regulation were positively correlated with mathematics achievement. However, text anxiety, and extrinsic goal orientation were the only variables that negatively correlated with mathematics achievement.

Shen (2005) using multivariate analysis made 5 individual comparisons between the US middle school systems and 5 Asian middle schools, which have typically been top, ranked in mathematics and science scores. Data was taken from TIMSS-1999. The discriminant analysis was based on variables related to school and classroom environment and students out of school life, home background, and self-perception about mathematics and science. The average number of instructional days per year varies from country to country. American eight graders spent more time by watching TV, and playing sports, and working a paid job much longer than compared with the their Asian counterparts. The US parents are more educated and in US more students have computer at home but less table/desk compared to Asian countries. The average achievement of American students are poorer than that of their Asian counterparts, but American students are more likely to think they do well in two subjects and perceive the two subjects as easy.

Birenbaum et.al. (2005) applying diagnostic model for large-scale assessment to TIMSS-R data and mathematics performance of eight graders from three countries was compared. Singapore's eight graders outperformed over their US and Israel counterparts in mathematics achievement. And also factor explained the Singapore students' mathematics achievement. Singapore has become one of the richest countries in the world by being intensely concerned with education and putting much emphasis on examinations, hence producing an internationally competent workforce. Parents value education is high and encourages their children to invest much effort in preparing for examination. Time spent on mathematics class is higher in Singapore

than other countries. And also students in Singapore spent more time on out of school for studying mathematics or doing homework. As to curriculum Singapore curriculum is non-repetitive and more focused in contras to other countries. As to the implemented curriculum, Singapore teachers invest much effort in coaching for the frequent exams and promote test taking strategies. Unlike the US and Israel, teacher salaries and mathematics backgrounds are high, and moreover as part of their job, Singapore's teachers are regularly engaged in extensive professional development.

Wang (2004) found that participating in mathematics club has no effect on students' mathematics achievement. Taking extra curricular activities, TV time, skipping class and students' absenteeism, was associated with lower mathematics achievement for students.

Using TIMSS 1999 African data and applied Partial Least Square Analysis Howei (2005) tried to find contextual factors that affect students' achievement at school and classroom level. At school level model sixty two percent of variance in the students score in mathematics explained by community where the school was located, the influence that the teacher union has on the curriculum and aggregated student variable, and the extent to which the pupil in the class spoke the language of instruction as their first languages. Factor not having direct effect included psychical resources and learning environments. Classroom level model the 46 % of the variance in pupils mathematics achievement explained by teacher attitudes, their beliefs about mathematics, the extent of their teaching and other work load, the size of the class they are teaching, their gender, resources, and their dedication towards lesson preparation. One of the interesting outcomes is the strength of teachers' attitudes as a predictor of pupils' achievement. Combined school and class levels factors related to teacher characteristics, pupils home background, their aptitude, their attitudes, school quality, teaching requirements, curriculum quality, and instructional quality were all explored in the model. 27 % of the variance explained by location of school, class size, the attitude of teacher, teachers' beliefs about mathematics, the teachers work load(including teaching), and their dedication toward lesson.

2.6 The Summary of the Literature Review

1) Family background factors affect mathematics achievement positively (Wöber,2005; Boss & Kuiper,1999; Shiller et. al. 2004; Beaton & O'Dewyer, 2002; Wang, 2004; Tağ, 2000).

2) The cultural socio-demographic characteristics of the community have less affect but the cultural resource and climate at school have great importance on mathematics achievement (Yang, 2003).

3) Students carrier plan is insignificant predictor of mathematics achievement (Ma, 1997; Webster & Fisher, 2000). However, Wöber (2005) found students' carrier aspiration has strong and positive effect on mathematics achievement.

4) Students' characteristics are the most significant predictor of mathematics achievement (Ma, 1997).

5) School and region are significant predictors for mathematics achievement (Ma, 1997; Webster & Fisher, 2000; Wöber,2005).

7) Student distribution across school and students academic location within schools produce decline on academic achievement (Marks, 2005).

8) Students who live traditional family are more successful in mathematics achievement (Marks,2006; Shiller et. al. 2004; Wang, 2004).

9) High expectation from mothers to do well in school and to go high achieving classes affects mathematics achievement positively (Wang, 2004).

10) There are positive relationships between mathematics achievement and attitude towards mathematics (Ma, 1997; Webster & Fisher, 2000; Wöber,2005, Papanastasiou , 2002c)

11) In his studies which conducted at 2000a and 20002a Papanastasiou could not found any relationships between mathematics achievement and attitude towards mathematics.

12) Students who attribute success in mathematics at hard work get higher mathematics score than students who attribute success to luck. (House, 2006; Kifer, 2002; Hommouri, 2004; Tağ, 2000).

13) There is a positive relationship between academic self concept, academic interest and academic achievement (Marsh et. al., 2005; Wilkins, 2004; Tağ, 2000; Greenwood, 1997)

15) Effectance motivation, usefulness of motivation and importance of mathematics positively affect attitude towards mathematics and this leads higher mathematics achievement (Tağ, 2000).

16) Mathematics anxiety affects mathematics attitudes negatively and negative attitudes associated with lower mathematics achievement (Tağ, 2000).

18) Students like mathematics and science and they enjoy learning these subjects but they think mathematics and science is not easy (Kifer, 2002).

19) Frequency of homework leads better mathematics achievement (Ma, 1997; Trauntein et. al., 2002; Revak, 1997; House, 2004).

20) Jaan (2006) did not found relationship between homework and achievement even he found negative effects on TIMSS results. And also typical homework assignments (indicated by the class average time typically spent on assignment) are very long, no additional positive effects are shown in the study which conducted by Trautwein et. al., (2002)

21) Students who use more frequently information and communication technologies for mathematics lesson have lower achievement than students who hardly use or do not use (Pelgrum & Plomp,2002; Papanastasiou c, 2002;

22) Students most widely use computer for games/adventure and word processing (Lewin, 2004; Haris, 1999)

23) Participation in mathematicsclubs has no effect on mathematics achievement (Wang, 2004).

24) Taking Extra curricular activities, TV time, skipping class, and students' absenteeism associated with lower mathematics achievement (Wang, 2004; Birenbaum et. al, 2005).

CHAPTER 3

METHODOLOGY

3.1. Population and Sample

The population in this study is 426 students who answer students achievement tests and students questionnaire in four different schools in Ankara. The schools were not randomly selected. One of the schools is socially and economically better from other schools, the other one medium and, others are worse. In general schools are coming from low socio-economic status, but one of them one respect relatively have higher socio-economic status than others. In the previous research, schools were mentioned as school A, school B, school C and school D. Mostly 8^{th} grade students involved in the study. But 27 students which are 7^{th} grade from school B and 34 students which are 7^{th} grade from school D also involved in the study. All the 8^{th} grade students from school B, school C, and school D participated to the study but only one class from school A involved in the study. 7^{th} grade classes which were thought to be best according to teachers were selected.

Table 3.1 Number of Students

	School A	School B	School C	School D
Boys	18	56	19	118
Girls	22	69	29	95
Total	40	125	48	213

3.2. Instruments

Mathematics Achievement Test was composed of selected released items from TIMSS 2003 Students Mathematics Achievement Test. Student Questionnaire was composed of TIMSS 99 questionnaire and TIMSS 2003 questionnaire items.

3.2.1. Students Questionnaire

All students, who participated in the study, were asked to complete a student questionnaire. The students' questionnaire items composed of mix of TIMSS 2003 Students Questionnaire items and TIMSS 1999 Students' Questionnaire items which implemented in Turkey.

The questionnaire aimed to seek information about the students' home background, attitudes and beliefs about mathematics and experiences in mathematics classes in TIMSS 99 (Yayan, 2003). ''TIMSS uses the curriculum as the major organizing concept in considering how educational opportunities are provided to and the factors that influence how studies use these opportunities. The intended curriculum (national, social and educational context), the implemented curriculum (school teacher, and classroom context) and the attained curriculum (students' outcomes and characteristics) are the TIMSS curriculum models. They represent society's intends for students to learn the mathematics and to facilitate this learning and to understand how education system should be organized: what is actually taught in classrooms, who teaches it, and how it is taught; and what the students are learning actually and what they think about these subjects'' (Mullis, et. al., 2004). To emerge policy concerns and to examine curricular goals the educational resources and provided facilities (the teaching force and how it is educated, equipped and supported; classroom activities and characteristics; home support and involvement; and students support and attitudes that students themselves bring to do educational enterprise) were particularly examined in TIMSS 2003 (Mullis, et. al., 2004). The questionnaires ask about the structure and content of the intended curriculum in mathematics: the preparation, experience, and attitudes of teachers, the mathematics content actually taught, used instructional approaches, the organization and resources of schools and classrooms, and the experiences and attitudes of the students in the schools (Mullis, et. al., 2004). The international version of the TIMSS 2003 Student Questionnaire obtained from the internet (IEA, n.d.). Some items of TIMSS 2003 were not in TIMSS 1999 students' questionnaire. So, these items were added to students' questionnaire which is used in the previous research. To conduct factor analysis 76 items were selected from the students' questionnaire according to literature review, percentage of missing data, and considering importance according to research. The items, which were included in factor analysis, were given at the

appendix A as in the order of student questionnaires. These items grouped under the ten sub dimensions which are: Perception of success, students centered instructional activities, teacher centered instructional activities, out of school activities I, socio economics status, out of school activities II, school climate, computer, reasons for mathematics success, and homework.

3.2.2. Grouping of Students Questionnaire Items

After factor analysis was conducted with selected items from students' questionnaire, items with higher loadings were clustered to form a factor dimension that will be used in the model based on the factor analysis of the data.

3.2.3. Mathematics Achievements Test

The mathematics framework developed by updating 1995 and 1999 assessment and widespread participation of educators around the world (Mullis, et. al., 2004). To evolve the content, the framework was revised to reflect changes during the last decade in curricular and the way mathematics and sciences are taught (Mullis, et. al., 2004). 'The following factors were considered in finalizing the content domains and the topics and objectives of the assessment frameworks.

> . Inclusion of the content in the curricula of a significant number of participating countries.
> . Alignment of the content domains with the reporting categories of TIMSS 95 and TIMSS 99.
> . The likely importance of content to be future developments in mathematics education.
> . Appropriateness for the populations of students being assessed.
> . Suitability for being assessed in a larger scale international study.
> . Contribution to overall test balance and overage of content and cognitive domains.' (Mullis, et. al., 2004)

The mathematics assessment framework for TIMSS 2003 framed two organizing dimensions or aspects, a content domain and a cognitive domain and these dimensions and their domains are foundation of mathematics assessment

(Mullis, et. al., 2004). Mathematics subject matter defined by these five content domains which are number, algebra, measurement, geometry, and data (Mullis, et. al., 2004). The four cognitive domains which include knowing facts and procedure, using concepts, solving routine problems, and reasoning define a set of behaviors expected of students while they engage with the mathematics content (Mullis, et. al., 2004).

TIMSS 2003 tests contain questions requiring students to select appreciate responses or to solve problems and answer questions in an open ended format, and place more emphasis on questions and tasks that offer better insight to students analytic problem solving and inquiry skills and capabilities. (Mullis, et. al., 2004). In TIMSS 2003 mathematics achievement test there are three types of items which are multiple choices; short answers which require students to write short answers; and the extended response items which require students to show their work or to provide explanations for their answers. One point was given to correct answer to most of the questions. Extended response questions were evaluated with partial credit, fully correct answers were given two points, partial correct answers were given one point and incorrect answers were given zero point.

Mathematics Achievement Test which is used in previous research composed of TIMSS 2003 released items. These released items and TIMSS 2003 students questionnaires were downloaded from http://isc.bc.edu which is official web site of TIMSS. Then these items were translated into Turkish and three parallel forms were prepared according to their cognitive domain and content domain. Items having the same cognitive domain and also the same content domain were included in each of the three booklets. For example, in booklet A if there was a question which had a content domain of number and cognitive domain of reasoning, the same kind of item within the same content and cognitive domains were also included in the booklet B and booklet C. In addition since the total score of the booklets were not equal to each other, total score translated into z score and z scores translated in to t scores and then analyses were conducted based on the standard t scores. A mathematics teacher, an English teacher and a Turkish Literature teacher checked these booklets and the translations. Not all of the released items were used because of the time constraints. There were 25 questions in each booklet. Some questions in the booklets were the

same for this reason there were 62 questions in total. The distribution of number of items according to their content domain is given in the Table 3.2 below.

Table 3.2 Distribution of Items According to Content Domain

	Number	Algebra	Measurement	Geometry	Data	Total
Number of items	23	18	6	9	6	62

The distribution of number of items according to their cognitive domain is given in Table 3.3 below.

Table 3.3 Distribution of Items According to Cognitive Domain

	Knowing Facts and Procedure	Using Concepts	Solving Routine Problems	Reasoning
Number of items	21	7	24	10

3.2.4 Validity and Reliability of Booklets and Questionnaire

After the items were selected, factor analyses were conducted to determine factors that would be included in the models as factors. The factors were composed of the items that had higher loadings on factor analyses. However, some of the items do not have higher loading to the factor they included in the analysis because of the meaningful loading. Factors' which were used in the study mostly do not include the same construct with the TIMSS dimensionality. The sub-dimensions based on the student questionnaire were re-defined based on the factor analysis results in the present study. The reliabilities of the booklets and questionnaire are reported in the Table 3.2 below.

Table 3.4 Reliabilities of booklets and questionnaire

	Booklet 1	Booklet 2	Booklet 3	General	Questionnaire
Alpha reliability coefficients	0.82	0.88	0.88	0.85	0.79

The alpha reliability coefficients are deemed adequate for the study.

3.3. Procedure

The present study started with review of the literature. Computer search was conducted about related studies used TIMSS data and also mathematics achievement. Then several books were searched in METU library to have information about Multiple Linear Regression. Data collection instruments were translated into Turkish and prepared. Then these instruments were administered.

In order to look the construction of the questionnaire many factor analyses were conducted with students' questionnaire. Then result of the descriptive statistics and the related literature items which included in the factor analysis were defined.

3.4. Data Collection

The three booklets were administered four different schools to 426 students in Ankara between 16 April 2006 and 30 April 2006. At schools testing was constructed at the same time to all classes by their teachers. The researcher gave necessary information before the testing was administered by the teachers and while completing the testing researcher were at schools. Before the administration teachers gave students instruction for completing questionnaire, and reminded the time limitation during the administration as well. Teachers emphasized students to complete all the items in the questionnaire concerning their feelings about mathematics courses. The achievement test and questionnaire were administered to one counseling hours of each test in each school. First students had completed mathematics achievement tests and after the break they were given questionnaires to complete.

Gathered data was imputed SPSS 10.0 packet program so editable SPSS data file was obtained.

3.5 Data Analysis

3.5.1 Missing Data Analysis

One of the criterions consulted during defining the items that would be analyzed was the missing percentages of the questionnaire items. Students' questionnaires items were analyzed to identify the missing data percentage. The criterion was 10 %. The final samples were given in Appendix A to deal with missing data and get the correct results in the factor analysis pairwise deletion method was preferred.

3.5.2 Effect Size

The typical null hypothesis implies that there is no effect or relationship between variables, whereas a test of statistical significance provides the qualified strength of evidence that null hypothesis is wrong, an effect size measures the degree to which such a null hypothesis is wrong (Grissom& Kim, 2005). In other words, effect size refers to magnitude of the impact of the independent variable on the dependent variable (Kline,2005).

Cohen's classification of effect size is used for social research; Cohen suggests a proper standard classification schema for effect size measured through correlation (R) (as cited in Grissom& Kim, 2005). This classification schema suggest that 0.10 is small, 0.30 is medium, and 0.50 or larger is the large effect size for the magnitude of the R.

3.5.3 Factor Analysis

Frankel and Wallen (1996) describe factor analysis as a procedure to determine whether many variables can be described by a few meaningful variables. A second purpose of factor analysis is to determine the nature of the common factors that account for the test intercorrelation, and a third purpose of factor analysis is to determine the proportion of the variance for an observed variable that is associated with common factors variance (Crocker & Algina, 1986).

3.5.4 Multiple Linear Regression

Predicting a dependent variable from a set of independent variables is the multiple regressions' interest. In general, in multiple regression the linear combination of independent variables' that is maximally correlate with the dependent variable are sought (Stevens, 2002).

While determining a suitable model with multiple regression;

n/k ratio , n is sample size an k is number of predictor,

F test for determining whether the population multiple correlation is different from 0

Multicolinearity

Assumptions

Existence of outliers and influential data points are checked.

Sample size (n) and number of of predictors (k) are two crucial factors determining given equations cross validation power. For small ratio the shrinkage in predictive power can be substantial (Stevens, 2002).

Predictors should be correlate significantly with dependent variables and the predictors relatively have no correlations or low correlations among themselves, so they measure different construct and are able to predict different parts of the variance on dependent variable. When there is moderate to high intercorrelation among the predictors the problem is referred to as multicolinearity (Stevens, 2002).

' In the linear regression model it is assumed that the errors are independent and follows a normal distribution with constant variance. The normality assumption can be checked by use of standardized or studentized residuals. The independence assumption implies that the subjects are responding independently from one another. If independence is violating only middle the type one error should be greater then the researchers thinks. There are various types of plots that are available for assessing potential problems with the regression models. One of the most useful graphs is the standardized versus the predicted values. If the assumptions of the linear regression model are tenable, then the standardized residuals should scatter randomly about a

horizontal line defined by r = 0' (Stevens, 2002). It was checked in the study and the results illustrating in Figure 4.3 ; Figure 4.6 and Figure 4.9 were shown in results chapter.

Outliers in the data are checked with Mahalanobis's distance, which indicates how far the case is from the centroid of all cases for the predictor variables (Stevens, 2002). A large distance indicates an observation that is an outlier for the predictors. D_i^2 is if the sample size is larger than 50 approximately proportional to h_{ii} (Stevens, 2002).

$$D_i^2 \approx (n-1)\, h_{ii} , \qquad h_{ii} = 2k/n$$

Cook's distance is a measure of the change in the regression coefficients that would occur if this case was omitted, thus revealing which case are more influential in affecting the regression equation. Thus Cook's distance measures the combined influence of the case being an outlier on dependent variable and on the set of predictor. Cook's distance should be < 0.1 if there is not influential outlier in the data. (Stevens, 2002)

In the recent study to select a good set of predictor stepwise method was used. Stepwise model due to the complexity of inter correlations, the variance explained by certain variables will change when new variables enter the equation(George & Mallery, 2003). Sometimes a variable that qualified to enter loses some of predictive validity when other variables enter and if this take place Stepwise method deletes the variable. This method probably most frequently used in regression model (George & Mallery, 2003).

CHAPTER 4

RESULTS

4.1 Descriptive Statistics

The variables that would be used in the factor analyses were examined by using descriptive statistics. The values of skewness in the data ranged from – 2.344 to 2.197 and kurtosis values ranged from – 1.948 to 5.716. Most of the values of skewness and kurtosis ranged from +2 and – 2 can be assumed approximately normal as suggested by Kunnan in 1998 (as cited in Yayan, 2003). According to Kline (1998) although the values out of this range represent non-normality this values are not problematic (as cited in Yayan, 2003). Appendix B displays the descriptive statistics of all selected items used in factor analysis.

The means and standard deviations of achievement test of schools and booklets are given below:

Table 4.1 The Means and Standard Deviations of Schools and Booklets

	School A	School B	School C	School D	Booklet A	Booklet B	Booklet C	Total
Mean	13	9	11.6	14.6	11.4	12.4	13.8	12.5
Sd	5.77	4.86	5	6.38	5.36	6.87	6.24	6.24

Observed variables that represent factors were selected based on the result of the factor analysis.

4.1.1 Result of Factor Analysis

Selected 76 items from Students Questionnaire were analyzed by using principle component analysis. Although there were 22 factors according to eigenvalues greater than 1, the scree test indicates 11 factors. While determining number of factors, interpretability of factor solution was used. Consequently 10 factors were rotated by using Varimax rotation procedure to provide interpretable

factors. The rotated solution yielded 10 interpretable factors which are: perception of success, instructional activities (student-centered), instructional activities (teacher-centered), out of school activities, socio-economic status, out of school activities II, school climate (bullying), computer, reason for being successful , homework. After the principle component factor analysis ten factors were obtained. The factors were interpreted by naming them based on the size of loadings, meaning of the items and also according to literature. The factors and items that constructed the corresponding factor and factor loadings were presented Table 4.2

Table 4.2 Principle Component Factor Analysis Results

	Factor Loadings									
Items	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
Successful in mathematics		0.76								
Like mathematics		0.75								
I am just not talented		0.74								
Do well in mathematics		0.74								
Enjoy learning mathematics		0.72								
I like if it were not so difficult		0.71								
Learn things quickly		0.70								
Mathematics is an easy subject		0.67								
Mathematics is boring		0.63								
More difficult for me then others		-0.63								
Not one of my strengths		0.63								
Like job involve mathematics		0.61								
I will never really understand It		-0.42								
Take more mathematics		0.39								
Having a quiz or test			0.60							
Work test book own our own			0.59							
New topic- work in small groups			0.58							
Work on mathematics projects			0.56							
A new topic- discussing problem			0.51							
Work in pairs or small group			0.50							
Use a computer			0.48							
Use calculator			0.47							
Teacher uses overhead			0.47							
Use daily life event			0.45							
New topic- teacher ask what we know			0.42							
Work problems own our own			0.33							
New topic-try to solve an example			0.23							
Listen lecture-style presentation				0.60						
We copy notes from the board				0.58						
Teacher show how to do problems				0.53						
Teacher uses board				0.52						
Teacher checks our homework				0.40						
The teacher give us homework				0.40						
New topic-teachers explain rules				0.30						
Do exactly what teachers say				0.27						

Table 4. 2 (Continued)

Watching comed, adventure	0.67				
Watching sport	0.65				
Watching video games	0.63				
Playing computer games	0.60				
I use the internet	0.51				
Playing sports	0.48				
Watching television and videos	0.46				
Playing or talking with friends	0.42				
Watching cartoons	0.40				
Watching music programs	0.36				
Mother education		0.65			
Father education		0.65			
I use a computer at home		0.60			
Books at home		0.51			
Doing jobs at home		-0.48			
How far in school do you expect to go		0.38			
have study desk/ table		0.36			
Go to theatre			0.78		
Join a concert			0.75		
Go to cinema			0.67		
Go to museum or art exhibition.			0.65		
I was hit or hurt by other student(s)				0.76	
I think other students hurt me				0.67	
Other students hurt some of friends				0.64	
I was made fun or called names				0.57	
I was left out of activities				0.51	
Something of mine was stolen				0.49	
Some of my friends miss the lessons				0.45	
Look up information for mathematics					0.83
Look up information for science					0.80
I process and analyze data					0.60
Successful-make me happy					0.70
Successful-get the job I want					0.70
Successful- to make my family happy					0.66
Successful-go to the university					0.58
Check each other's homework					0.70
Discuss completed homework					0.55
Review our homework					0.50

The eigenvalues, percentage of variance, percentage of cumulative and alpha values for reliability of factors were shown in Table 4.3. Total variance accounted by all the factors was 44.79 %.

Table 4.3 Rotation Sum of Squared Loadings and Reliability of Factors

Component	Eigen value	% of Variance	Cumulative %	Reliability
1. Perception of Success	8.04	10.58	10.58	0.15
2. Instructional Activities (student-centered)	5.28	6.95	17.52	0.76
3. Instructional Activities (teacher-centered)	4.46	5.87	23.39	0.68
4. Out of School Activities I	3.16	4.16	27.55	0.74
5. Socio-economic Status	2.93	3.85	31.40	0.54
6. Out of School Activities II	2.45	3.23	34.63	0.81
7. Bullying	2.14	2.821	37.45	0.72
8. Computer	2.00	2.63	40.08	0.83
9. Success	1.93	2.53	42.62	0.69
10. Homework	1.64	2.16	44.78	0.56

Factor analysis was conducted to define the dimension of a set of items from student questionnaire to select appropriate observed variables to form a factor that would be included in the model. To constitute a factor at least three items in higher loadings were selected from each factor. The selected observed variables and the name of factors are given in Table4.4

Table 4.4 Observed Variables and Factors

Factors	Observed Variable
Perception of Success (PERSUCC)	I usually successful in mathematics How much do you like mathematics? Nobody cab be good in ever subject and, I am just not talented in mathematics. I usually successful in mathematics I enjoy learning mathematics. I would like to mathematics much more if it were not so difficult I learn things quickly in mathematics Mathematics is an easy subject Mathematics is boring Mathematics is more difficult for me than from many of classmates Mathematics is not one of my strengths I would like a job that involved using mathematics Sometimes, when I do not understand a new topic in mathematics initially, I know that, I will never really understand it I would like to take more mathematics in school

Table 4.4 (Continued)

Instructional Activities (student-centered) (STUACT)	We have a quiz or test , We work from worksheets or test book own our own When we begin a new topic in mathematics, we begin by working together in pairs or small groups on problem or projects We work on mathematics projects When we begin a new topic in mathematics, we begin by discussing a practical or problem related to daily life We work together in pairs or small groups. We use a calculator We use computer The teacher uses overhead We use event from daily life while solving problems in mathematics When we begin a new topic in mathematics, we begin by having the teacher ask what we know related to new topic We work problems own our own When we begin a new topic in mathematics, we begin by trying to solve an example about new topic
Instructional Activities) (teacher-centered) (TEACHACT)	We listen to teacher give a lecture-style presentation We copy notes from the board The teacher show us how to do mathematics problems The teacher uses board The teacher checks our homework The teacher gives us homework When we begin a new topic in mathematics, we begin by having the teachers explain the rules and the definitions In a mathematics lessons students do exactly what their teachers say
Out of School Activities I (OUTOFSCH I)	Watching comedy, adventure Watching sport Watching video games Playing computer games I use the internet Playing sports Watching television and videos Playing or talking with friends outside of school Watching cartoons Watching popular music programs
Socio-economic Status (SES)	How far in school did your mother go? How far in school did your father go? I use a computer at home About how many books are there in your home? Doing jobs at home How far in school do you expect to go? Do you have study desk/ table for your use at your home?

Table 4.4 (Continued)

Out of School Activities II (OUTOFSCH II)	Go to museum or art exhibition. Join a concert Go to theatre Go to cinema
School Climate (BULLYING)	In school something of mine was stolen last month. In school, I think other students hurt me In school, last month, some of my friends miss the lessons. In school, last month some of my friends' things were stolen. In schools, last month other students hurt some of friends In school, I was hit or hurt by other student(s)(e.g. shoving, hitting, kicking) last month In school last month, I was made fun or called names. In school last month, I was left out of activities by other students
Computer (COMPUTER)	I look up ideas and information for mathematics with a computer I look up ideas and information for science with a computer I process and analyze data
Reason for Being Successful (SUCCESS)	I need to be successful in mathematics to get the job I want I need to be successful in mathematics to make my family happy I need to be successful in mathematics to get in to the university or secondary school of my choice I need to be successful in mathematics to make me happy
Homework (HOMEWORK)	We check each other's homework We discuss our completed homework We review our homework

4.2. Inferential Statistics

After factor analysis was conducted SPSS 10.00 was used to formulate and estimate the mathematics achievement model with Multiple Linear Regression. The scores which obtained from the each booklet were not equal so before the analyses all the data was transformed into first z score by using this formula:

(total score – mean) ÷ standard deviation

And then z scores transformed into t score by using this formula:

(z score x 10) + 50

In addition before the regression analyses factor scores were calculated and these factor scores were used in conducting regression analyses. Factor Scores' means and standard deviations are given below:

Table 4.5 Means and Standard Deviations of Factor Scores

	Factors	Standard Deviations	Means
1.	Perception of Success	1.10	0.10
2.	Instructional Activities (student-centered)	0.95	-0.08
3.	Instructional Activities (teacher-centered)	1.00	0.00
4.	Out of School Activities I	1.04	-0.02
5.	Socio-economic Status	0.98	0.08
6.	Out of School Activities II	0.81	-0.15
7.	Bullying	0.98	0.02
8.	Computer	0.99	-0.02
9.	Success	0.90	0.09
10.	Homework	0.97	0.05

4.2.1 Result of Testing the Problem of the Study

The problem of the study is the following: 'How much mathematics achievement is explained by students and school related factors?' For investigating this problem a hypothesis was stated and given below:

H. The ten variables together (perception of success, students centered instructional activities, teacher centered instructional activities, out of school activities, socio economics status, out of school activities II, school climate, computer, reasons for mathematics success, and homework) do not explain a significant amount of variance in students' mathematics achievements.

While determining how well a given equation will cross-validate (generalize) two factors are crucial: sample size (n) and number of predictors (k). In the previous research since sample sizes are 426 and there are 10 predictors variable this ratio is quite high.

Another important thing in linear regression is the assumption in which errors are independent and follow a normal distribution with constant variance. The normality assumption checked the use of the standardized residuals' histogram, regression plot and scatter plot.

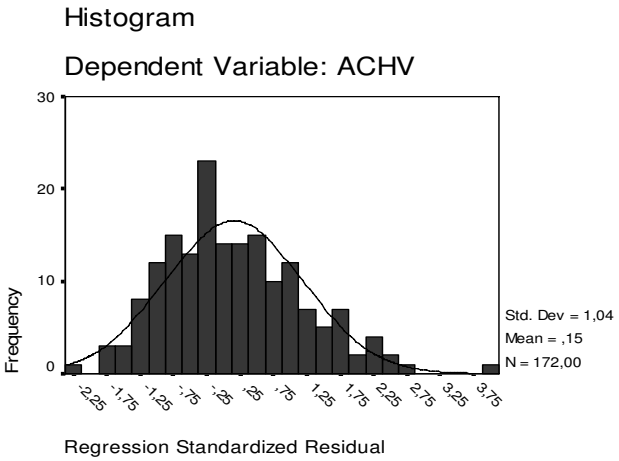

Figure 4.1 Histogram of Regression Standardized Residual

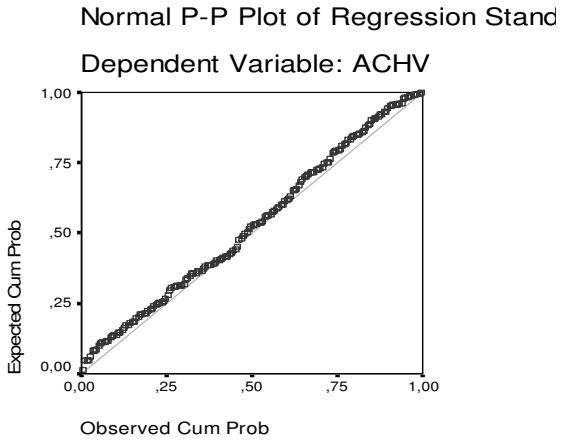

Figure 4.2 Normal P-P Plot of Regression Standardized Residual

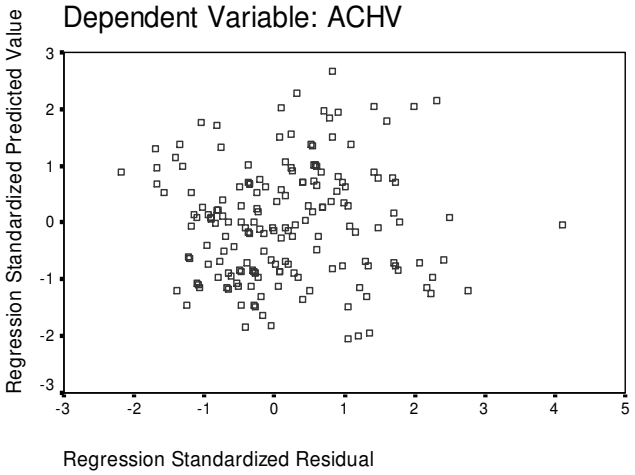

Figure 4.3 Scatter Plot of Regression Standardized Residual

To determine there is an outlier and if there are affects on dependent variable first a predictor's Mahalanobis's distance was computed and then Cook's distance was checked with the formula which is given below.

$D_i^2 \approx (n-1)\, h_{ii}, \qquad h_{ii} = 2k/n$

$h_{ii} = 2.10/\ 426 = 0.047$

$D_i^2 = (426 - 1).\ 0.047 = 19.95$

Table 4.6 Mahalanobis's Distance Cook's Distance

	Minimum	Maximum	Mean	Std. Deviation
Mahal. Distance	0.38	13.52	3.98	2.57
Cook's Distance	0.00	0.07	0.08	0.01

a Dependent Variable: ACHV

As shown in the Table 4.6 Mahalanobis's distance is between 0,382 and 13.522 it did not exceed 19.95 and Cook's distance is smaller than 0.1. So there is not an influential outlier in the model.

To deal with multicolinearity problem interrelationships among the variables were examined before testing the hypothesis. Pearson product moment correlations were conducted to examine the interrelationships among the measures. The correlation matrix is presented in Table 4.7

Table 4.7 Pearson Product Moment Correlations Among Measures for All Subjects of the Study

	1	2	3	4	5	6	7	8	9	10	11
ACH	1.00	0.33	-0.03	-0.16	0.02	0.37	-0.11	0.03	-0.08	0.06	-0.15
PERSUCC	0.33	1.00	-0.01	-0.13	0.03	0.03	0.00	0.07	0.06	0.04	0.06
STUACT	-0.02	-0.01	1.00	0.07	-0.09	0.01	0.18	0.07	0.01	0.08	-0.10
TEACACT	-0.16	-0.13	0.07	1.00	0.02	-0.05	0.06	0.05	0.06	-0.07	0.08
OUTOFSCH I	0.02	0.03	-0.09	0.02	1.00	0.04	0.07	-0.11	-0.08	0.03	0.04
SES	0.37	0.03	0.07	-0.05	0.04	1.00	0.11	005	0.13	0.07	0.06
OUTOFSCH II	-0.11	0.00	0.18	0.07	0.07	0.11	1.00	0.04	0.09	0.04	0.09
BULLYING	0.03	0.07	0.07	0.05	-0.11	0.05	0.04	1.00	0.06	0.17	0.05
COMPUTER	-0.09	0.06	0.01	0.06	-0.07	0.13	0.08	0.05	1.00	-0.14	0.04
SUCCESS	0.06	0.04	0.08	-0.07	0.03	0.07	0.04	0.17	-0.15	1.00	-0.05
HOMEWORK	-0.15	0.06	-0.10	0.08	0.04	0.06	0.09	0.05	0.04	-0.05	1.00

$p < 0.05$

The stated hypothesis was examined by using Linear Stepwise Regression at a significant level of 0.05. So The Table 4.7 shows that predictor variables (ACH, PERSCU, STUACT, TEACACT, OUTOFSCH I, SES, OUTOFSCH II, BULLYING, COMPUTER, SUCCESS, HOMEWORK) do not have high correlations among themselves. Therefore it was deduced that multicollinearity was not a problem for the present study.

Table 4.8 Linear Stepwise Regression Analysis Results for Combined Effect of Four Significant Predictor Variables on Mathematics Achievement Regression Statistics

Multiple R	0.548
R Square	0.301
Adjusted R Square	0.284
Standard Error	8.4556

	SS	df	MS	F	Sig F
Regression	5137.21	4	1284.30	17.96	0.00
Residual	11940.07	167	71.49		
Total	17077.28	171			

P< 0.05

As table 4.8 indicates that four variables together (SES, PERSUC, HOMEWORK, COMPUTER) explained a significant amount on variance in students mathematics achievement. $R^2 = 0.301$, F= 17.96 and p = 0.00 indicates that 30.1 percent of the variance are explained with these variables.

The individual effect of each predictor can be seen in Table 4.9. According to this table SES, PERSUCC, HOMEWORK, COMPUTER explains individually a significant amount of variance in mathematics achievement.

Table4.9 Linear Stepwise Regression Analysis Results for Individual Effects of Four Significant Predictor Variables on Mathematics Achievement

Variables	Standardized Coefficients	Standard Error	t Ratio	p-value
SES	0.390	0.670	5.96	0.000
PERSUCC	0.343	0.589	5.28	0.000
HOMEWORK	-0.191	0.670	-2.94	0.004
COMPUTER	-0.150	0.623	-2.28	0.023

P< 0.05

Using Table 4.9, a linear regression equation can be written in order to estimate students' mathematics achievement from four significant predictors. The regression equation with these four predictors is significantly related to mathematics achievement.

This equation is:

$$Y = 0.390\ X_1 + 0.343\ X_2 - 0.191\ X_3 - 0.150\ X_4$$

Where Y represents the predicted mathematics achievement, and X_1, X_2, X_3, X_4 represents socio- economic status, perception of success, homework, and computer respectively.

Other variables, STUACT, TEACACT, OUTOFSCH I, OUTOFSCH II, BULLYING, and SUCCESS, was excluded from the equation because they do not have significant contribution to variance in mathematics achievement. Table 4.10 shows results of six excluded variables' stepwise linear regression analysis.

Table4.10 Result of Linear Stepwise Regression Analysis of Six Excluded Variables

Variables	Beta In	t-value	Partial	Tolerance	Correlation
STUACT	-0.045	-0.696	0.488	-0.054	0.990
TEACACT	-0.071	-1.079	0.282	-0.083	0.968
OUTOFSCH I	-0.007	-0.104	0.917	-0.008	0.989
OUTOFSCH II	-0.128	-1.969	0.051	-0.151	0.976
BULLYING	0.006	0.099	0.921	0.008	0.989
SUCCESS	-0.010	-0.145	0.885	-0.011	0.965

To assess the extent to which variables could accounts for mathematics achievements, a linear stepwise regression was performed with mathematics achievement (ACH) on a) perception of success (PERSUCC), b) student centered instructional activities (STUACT), c) teacher centered instructional activities (TEACACT), d) out of school activities I (OUTOFSCH I), e) socio-economic status (SES), f) out of school activities II (OUTOFSCH II), g) school climate (BULLYING), h) computer (COMPUTER), ı) success attribution (SUCCESS), j) homework (HOMEWORK). As it can be seen in Table 4.11 only SES, PERSUCC,

HOMEWORK, COMPUTER are the strongest significant predictors of mathematics achievement.

Table.4.11 Linear Stepwise Regression Analysis of Four Significant Predictor Variables on Mathematics Achievement

Model	R Square	Std. Error of the Estimate
1	0 .137	9.3104
2	0 .241	8.7577
3	0 .279	8.5616
4	0 .301	8.4556

a Predictors: (Constant), SES
b Predictors: (Constant), SES, PERSUCC
c Predictors: (Constant), SES, PERSUCC, HOMEWORK
d Predictors: (Constant), SES, PERSUCC, HOMEWORK, COMPUTER
e Dependent Variable: ACHV

R^2 change = 0.137, F = 27.009, and p = 0.000 as can also be seen in Table 4.11 SES was the strongest significant predictor of mathematics achievement accounting for 13.7 % of the variance in mathematics achievement. PERSUCC accounted for additional 10.4 % of the variance, R^2 change = 0.077, F = 23.134, and p = 0.000. HOMEWORK accounted for an additional 3.8 % change R^2 change = 0.038, F = 8.829, and p = 0.003. COMPUTER accounted for 2.2 change R^2 change = 0.022, F = 5,238, and p = 0,023.

4.2.2 Result of Testing Hypothesis of the Reasoning Level

The sub problem (P.1) 'In what extent students' and school related factors components could account for students mathematics achievements of answering reasoning level questions?'

For investigating this sub problem a hypothesis was stated and given below:
H.1 The ten variables together (perception of success, students centered instructional activities, teacher centered instructional activities, out of school activities, socio economics status, out of school activities II, school climate, computer, reasons for mathematics success, and homework) do not explain a significance amount of

variance in students mathematics achievements of answering reasoning level questions.

According to normality assumption errors are independent and follow a normal distribution with constant variance. The normality assumption checked the use of the standardized residuals' histogram, regression plot and scatter plot.

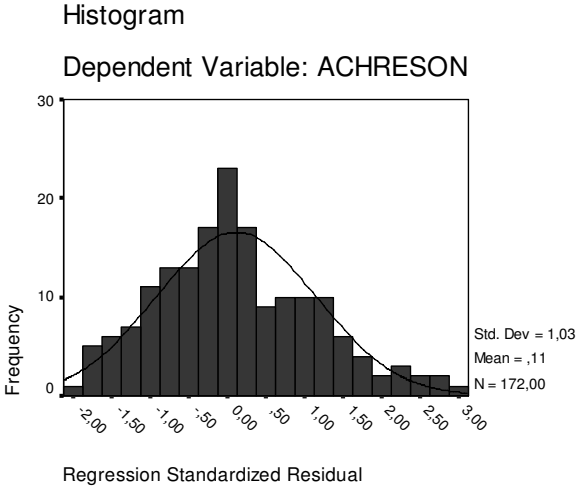

Figure 4.4. Histogram of Regression Standardized Residual of Reasoning Level

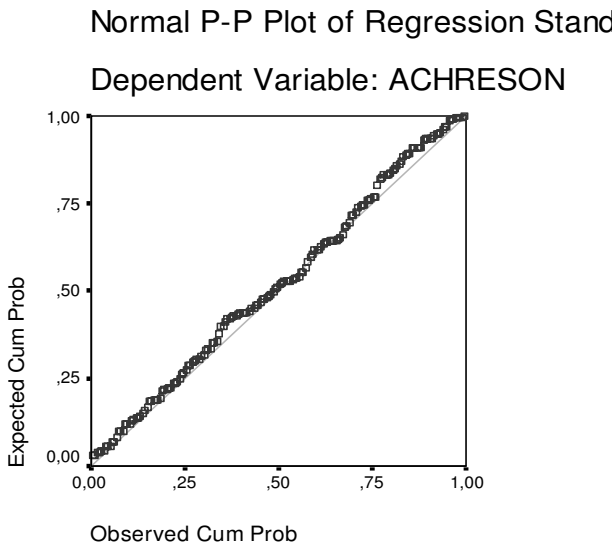

Figure 4.5 Normal P-P Plot of Regression Standardized Residual

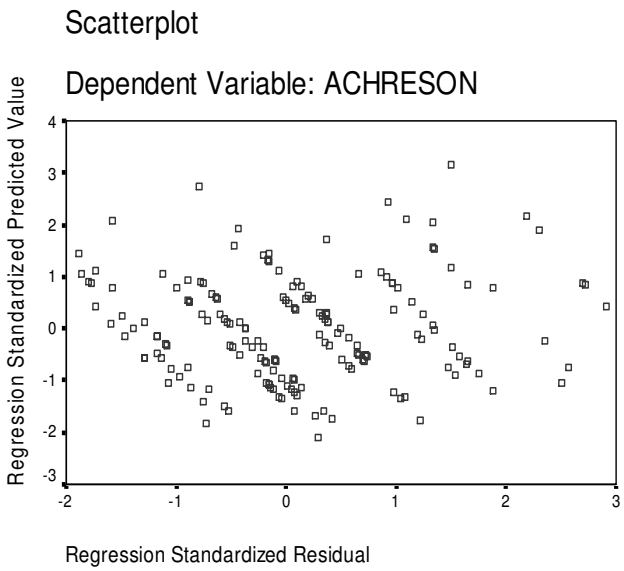

Figure 4.6 Scatter Plot of Regression Standardized Residual

To determine there is an outlier and if there are affects on dependent variable a predictor first Mahalanobis's distance was computed and then Cook's distance was checked with the formula which is given below.

$D_i^2 \approx (n-1)\, h_{ii}, \qquad h_{ii} = 2k/n$

$h_{ii} = 2.10/\ 426 = 0.047$

$D_i^2 = (426 - 1).\ 0.047 = 19.95$

Table 4.12 Mahalanobis's Distance Cook's Distance of Reasoning Level Study

	Minimum	Maximum	Mean	Std. Deviation
Mahal. Distance	0.284	11.181	0.2983	2.181
Cook's Distance	0.000	0.049	0.006	0.010

a Dependent Variable: ACHV

As shown in the Table 4.12 Mahalanobis's distance is between 0.284 and 11.181 it did not exceed 19.95 and Cook's distance is smaller than 0.1. So there is not an influential outlier.

To deal with multicollinearity problem interrelationships among the variables were examined before testing the hypothesis. Pearson product moment correlations were conducted to examine the interrelationships among measures. The correlation matrix is presented in Table 4.13

Table 4.13 Pearson Product Moment Correlations among Measures for All Subject s of the Reasoning Level Study

	1	2	3	4	5	6	7	8	9	10	11
ACH	1.00	0.27	-0.02	-0.56	-0.01	0.28	-0.08	-0.05	0.07	-0.08	-0.11
PERSUCC	0.27	1.00	-0.01	-0.13	0.03	0.03	0.00	0.07	0.06	0.04	0.06
STUACT	-0.02	-0.01	1.00	0.07	-0.09	0.01	0.18	0.07	0.01	0.08	-0.10
TEACACT	-0.06	-0.13	0.07	1.00	0.02	-0.05	0.07	0.05	0.06	-0.07	0.08
OUTOFSCH I	-0.01	0.03	-0.08	0.02	1.00	0.04	0.07	-0.11	-0.08	0.03	0.04
SES	0.28	0.03	0.01	-0.05	0.04	1.00	0.11	0.05	0.13	0.07	0.06
OUTOFSCH II	-0.08	0.00	0.18	0.07	0.07	0.11	1.00	0.04	0.09	0.04	0.09
BULLYING	-0.06	0.07	0.07	0.05	-0.11	0.05	0.04	1.00	0.06	0.17	0.05
COMPUTER	0.07	0.06	0.01	0.06	-0.08	0.13	0.08	0.06	1.00	-0.15	0.04
SUCCESS	-0.09	0.04	0.08	-0.07	0.03	0.07	0.04	0.17	-0.15	1.00	-0.05
HOMEWORK	-0.11	0.07	-0.10	0.08	0.04	0.06	0.09	0.05	0.04	-0.05	1.00

$p < 0.05$

The stated hypothesis was examined by using Linear Stepwise Regression at a significant level of 0.05. So The Table 4.13 shows that predictor variables (ACH, PERSUCC, STUACT, TEACACT, OUTOFSCH I, SES, OUTOFSCH II, BULLYING, COMPUTER, SUCCESS, HOMEWORK) do not have high correlations among themselves. Therefore it was deduced that multicollinearity was not a problem for the present study.

Table 4.14 Linear Stepwise Regression Analysis Results for Combined Effect of Three Significant Predictor Variables on Reasoning Level Mathematics Achievement

Regression Statistics

Multiple R	0.413
R Square	0.170
Adjusted R Square	0.156
Standard Error	9.0945

	SS	df	MS	F	Sig F
Regression	2855.783	3	951.928	11.509	0.000
Residual	13895.392	168	82.711		
Total	16751.175	171			

$P < 0.05$

As table 4.14 indicates that three variables together (SES, PERSUC, HOMEWORK) explained a significant amount on variance in students mathematics achievement. $R^2 = 0.170$, $F = 17.96$ and $p = 0.00$ indicates that 17 percent of the variance are explained with these variables.

The individual effects of each predictors can be seen Table 4.15. According to this table SES, PERSUCC, HOMEWORK explains individually a significant amount of variance in mathematics achievements.

Table 4.15 Linear Stepwise Regression Analysis Results for Individual Effects of Three Significant Predictor Variables on Reasoning Level Mathematics Achievement

Variables	Standardized Coefficients	Standard Error	t Ratio	p-value
SES	0.280	0.715	3.975	0.000
PERSUCC	0.276	0.632	3.922	0.000
HOMEWORK	-0.145	0.721	-2.050	0.042

$P < 0.05$

Using table 4.15, a linear regression equation can be written in order to estimate students' mathematics achievement from three significant predictors. The regression equation with these three predictors is significantly related to mathematics achievement.

This equation is:

$$Y = 0.280\ X_1 + 0.276\ X_2 - 0.145\ X_3$$

Where Y represents the predicted mathematics achievement, and X_1, X_2, X_3, represents socio- economic status, perception of success, and homework respectively.

Other variables, STUACT, TEACACT, OUTOFSCH I, OUTOFSCH II, BULLYING, SUCCESS, and COMPUTER are excluded from the equation because they do not have significant contribution to variance in mathematics achievement. Table 4.16 shows results of six excluded variables' stepwise linear regression analysis.

Table4.16 Result of Linear Stepwise Reasoning Level Regression Analysis of Seven Excluded Variables

Variables	Beta In	t	p-value	Partial Correlation	Tolerance
STUACT	-0.045	-0.696	0.488	-0.054	0.990
TEACACT	-0.071	-1.079	0.282	-0.083	0.968
OUTOFSCH I	-0.007	-0.104	0.917	-0.008	0.989
OUTOFSCH II	-0.128	-1.969	0.051	-0.151	0.976
BULLYING	0.006	0.099	0.921	0.008	0.989
SUCCESS	-0.010	-0.145	0.885	-0.011	0.965
COMPUTER	0.270	0.381	0.704	0.290	0.979

To assess the extent to which variables could accounts for mathematics achievements, a linear stepwise regression was performed with mathematics achievement (ACH) on a) perception of success (PERSUCC), b) student centered instructional activities (STUACT), c) teacher centered instructional activities (TEACACT), d) out of school activities I (OUTOFSCH I), e) socio-economic status (SES), f) out of school activities (OUTOFSCH II), g) bullying (BULLYING), h) computer (COMPUTER), ı) success attribution (SUCCESS), j) homework (HOMEWORK). As can be seen in Table 4.17 only SES, PERSUCC, HOMEWORK were the strongest significant predictors of mathematics achievement.

Table.4.17 Linear Stepwise Regression Analysis of Three Significant Predictor Variables on Reasoning Level Mathematics Achievement

	R Square	Std. Error of the Estimate
Model		
1	0.078	9.5293
2	0.150	9.1803
3	0.170	9.0945

a Predictors: (Constant), SES
b Predictors: (Constant), SES, PERSUCC
c Predictors: (Constant), SES, PERSUCC, HOMEWORK
d Dependent Variable: ACHV

R^2 change = 0.280, F = 14.470, and p = 0.000 as can also be seen in Table 4.17 SES was the strongest significant predictor of mathematics achievement accounting for 7.8 % of the variance in mathematics achievement. PERSUCC accounted for additional 7.2 % of the variance, R^2 change = 0.072, F = 14.168 and p = 0.000. HOMEWORK accounted for an additional 2% change R^2 change = 0.020, F = 4.204, and p = 0.000.

4.2.3 Result of Testing Hypothesis of the Basic Mathematical Knowledge Level

The other sub problem (P.2) In what extent students' background and school factors components could account for students mathematics achievements of answering basic mathematical knowledge level questions?

For investigating this sub problem a hypothesis was stated and given below:

H.2 The ten variables together (perception of success, students centered instructional activities, teacher centered instructional activities, out of school activities, socio economics status, out of school activities II, school climate, computer, reasons for mathematics success, and homework) do not explain a significance amount of variance in students mathematics achievements of answering basic mathematical knowledge level questions?

According to normality assumption errors are independent and follow a normal distribution with constant variance. The normality assumption checked the use of the standardized residuals' histogram, regression plot and scatter plot.

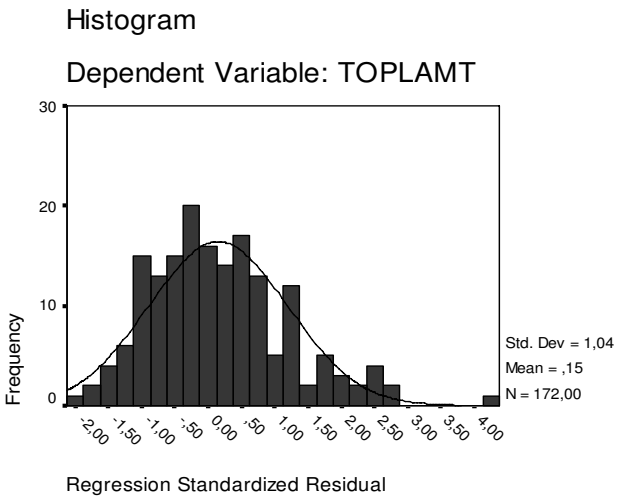

Figure 4.7. Histogram of Regression Standardized Residual of Basic Mathematical Knowledge Level

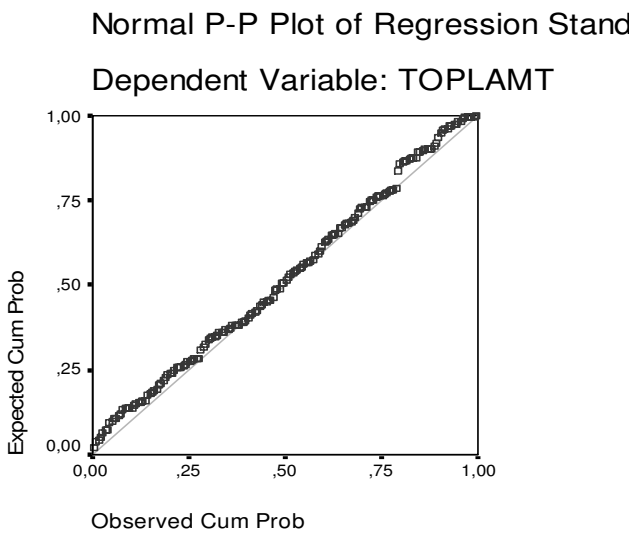

Figure 4.8 Normal P-P Plot of Regression Standardized Residual of Basic Mathematical Knowledge Level

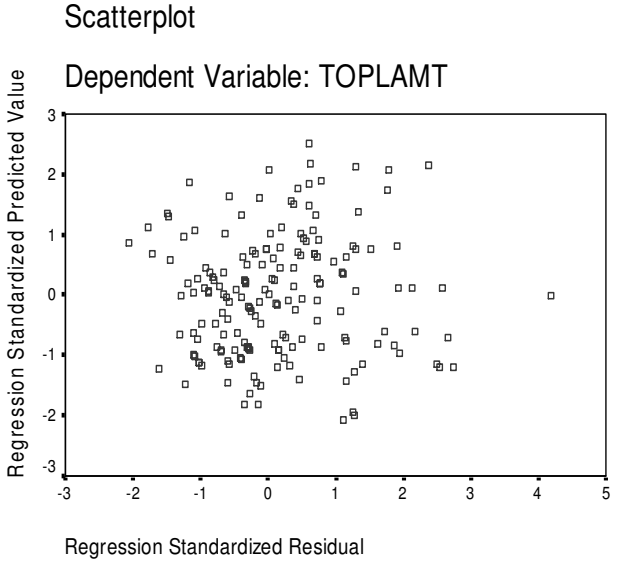

Figure 4.9 Scatter Plot of Regression Standardized Residual of Basic Mathematical Knowledge Level

To determine there is an outlier and if there are affects on dependent variable a predictor's first Mahalanobis's distance was computed and then Cook's distance was checked with the formula which is given below.

$D_i^2 \approx (n-1)\, h_{ii}, \qquad h_{ii} = 2k/n$

$h_{ii} = 2.10/\ 426 = 0{,}047$

$Di^2 = (426 - 1).\ 0.047 = 19.95$

Table 4.18 Mahalanobis's Distance Cook's Distance of Basic Mathematical Knowledge Level

	Minimum	Maximum	Mean	Std. Deviation
Mahal. Distance	0.382	13.522	3.977	2.568
Cook's Distance	0.000	0.071	0.007	0.012

a Dependent Variable: ACHV

As shown in the Table 4.18 Mahalanobis's distance is between 0.382 and 13.522 it did not exceed 19.95 and cook's distance smaller than 0.1. So there is not an influential outlier.

To deal with multicolinearity problem interrelationships among the variables were examined before testing the hypothesis. Pearson product moment correlations were conducted to examine the interrelationships among measures. The correlation matrix is presented in Table 4.19

Table 4.19 Pearson Product Moment Correlations among Measures for All Subject s of the Basic Mathematical Knowledge Level Study

	1	2	3	4	5	6	7	8	9	10	11
ACH	1.00	0.32	-0.03	-0.15	0.03	0.40	-0.11	0.04	-0.11	0.08	-0.15
PERSUCC	0.32	1.00	-0.01	-0.13	0.03	0.03	0.00	0.07	0.06	0.04	0.07
STUACT	-0.03	-0.01	1.00	0.07	-0.09	0.01	0.18	0.07	0.01	0.08	-0.10
TEACACT	-0.19	-0.13	0.07	1.00	0.02	-0.05	0.06	0.05	0.06	-0.07	0.08
OUTOFSCH I	0.03	0.03	-0.08	0.02	1.00	0.04	0.07	-0.11	-0.08	0.03	0.04
SES	0.36	0.03	0.01	-0.05	0.04	1.00	0.11	0.05	0.13	0.07	0.06
OUTOFSCH II	-0.11	0.00	0.18	0.06	0.07	0.11	1.00	0.04	0.09	0.04	0.09
BULLYING	0.04	0.07	0.07	0.05	-0.11	0.05	0.04	1.00	0.06	0.17	0.05
COMPUTER	-0.11	0.06	0.01	0.06	-0.08	0.13	0.08	0.06	1.00	-0.15	0.04
SUCCESS	0.08	0.04	0.07	-0.07	0.03	0.07	0.04	0.17	-0.15	1.00	-0.05
HOMEWORK	-0.15	0.06	-0.10	0.08	0.04	0.06	0.09	0.05	0.04	-0.48	1.00

$p < 0.05$

The stated hypothesis was examined by using Linear Stepwise Regression at a significant level of 0.05. So The Table 4.19 shows that predictor variables (ACH, PERSUCC, STUACT, TEACACT, OUTOFSCH I, SES, OUTOFSCH II, BULLYING, COMPUTER, SUCCESS, HOMEWORK) do not have high correlations among themselves. Therefore it was deduced that multicolinearity was not a problem for the present study.

Table4.20 Linear Stepwise Regression Analysis Results for Combined Effect of Four Significant Predictor Variables on Basic Mathematical Knowledge Level Mathematics Achievement

Regression Statistics

Multiple R	0.540
R Square	0.292
Adjusted R Square	0.275
Standard Error	8.5148

	SS	df	MS	F	Sig F
Regression	4884.439	4	1246.110	17.187	0.000
Residual	12107.740	167	72.501		
Total	17092.179	171			

P< 0.05

As table 4.20 Indicates that four variables together (SES, CPERSUC, HOMEWORK, COMPUTER) explained a significant amount on variance in students mathematics achievement. $R^2 = 0.292$, F= 17.187 and p = 0.00 indicates that 29.2 percent of the variance are explained with these variables.

The individual effect of each predictor can be seen in Table4.21. According to this table SES, PERSUCC, HOMEWORK, COMPUTER explain individually a significant amount of variance in mathematics achievements.

Table 4.21 Linear Stepwise Regression Analysis Results for Individual Effects of Four Significant Predictor Variables on Mathematics Achievement

Variables	Standardized Coefficients	Standard Error	t Ratio	p-value
SES	0.383	0.674	5.825	0.000
PERSUCC	0.332	0.593	5.082	0.000
HOMEWORK	-0.183	0.675	-2.796	0.006
COMPUTER	-0.178	0.668	-2.702	0.008

P< 0.05

Using table 4.21, a linear regression equation can be written in order to estimate students' mathematics achievement from four significant predictors. The regression equation with these four predictors is significantly related to mathematics achievement.

This equation is:

$$Y = 0.383\ X_1 + 0.332\ X_2 - 0.183\ X_3 - 0.178\ X_4$$

Where Y represents the predicted mathematics achievement, and X_1, X_2, X_3, X_4 represent socio-economic status, perception of success, homework, and computer respectively.

Other variables, STUACT, TEACACT, OUTOFSCH I, OUTOFSCH II, BULLYING, and SUCCESS, are excluded from the equation because they do not have significant contribution to variance in mathematics achievement. Table 4.22 shows results of six excluded variables' stepwise linear regression analysis.

Table4.22 Result of Linear Stepwise Regression Analysis of Six Excluded Variables

Variables	Beta In	t	p-value	Partial Correlation	Tolerance
STUACT	-0.044	-0.669	0.504	-0.052	0.990
TEACACT	-0.063	0.979	0.341	-0.074	0.968
OUTOFSCH I	-0.001	-0,014	0.989	-0.001	0.989
OUTOFSCH II	-0.119	-1.825	0.070	-1.140	0.976
BULLYING	0.019	0.289	0.773	0.022	0.989
SUCCESS	-0.008	0.127	0.899	0.010	0.965

To assess the extent to which variables could accounts for mathematics achievements, a linear stepwise regression was performed with mathematics achievement (ACH) on a) perception of success (PERSUCC), b) student centered instructional activities (STUACT), c) teacher centered instructional activities (TEACACT), d) out of school activities I (OUTOFSCH I), e) socio-economic status (SES), f) out of school activities (OUTOFSCH II), g) bullying (BULLYING), h)

computer (COMPUTER), ı) success attribution (SUCCESS), j) homework (HOMEWORK). As can be seen Table 4.23 only SES, PERSUCC, HOMEWORK, COMPUTER was the strongest significant predictor of mathematics achievement.

Table.4.23 Linear Stepwise Regression Analysis of Four Significant Predictor Variables on Mathematics Achievement

Model	R Square	Std. Error of the Estimate
1	0.129	9.3556
2	0.226	8.8497
3	0.261	8.6730
4	0.292	8.5148

a Predictors: (Constant), SES
b Predictors: (Constant), SES, PERSUCC
c Predictors: (Constant), SES, PERSUCC, HOMEWORK
d Predictors: (Constant), SES, PERSUCC, HOMEWORK, COMPUTER
e Dependent Variable: ACHV

R^2 change = 0.129, F = 25.278, and p = 0.000 as can also be seen Table 4.23 SES was the strongest significant predictor of mathematics achievement accounting for 12.9% of the variance in mathematics achievement. PERSUCC accounted for additional 9.7 % of the variance, R^2 change = 0.097, F = 20.911, and p = 0.000. HOMEWORK accounted for an additional 3.5% change R^2 change = 0.035, F = 7.958, and p = 0.003. COMPUTER accounted for 3.1 change R^2 change = 0.031, F = 7.301, and p = 0.008.

4.2.4 Effect Sizes

As mentioned in methodology section the measure of effect size used in multiple regression equivalent to the squared multiple correlation (R). Therefore, magnitudes of effect sizes for each analysis dependent variable were reported in measure of multiple correlations.

Table 4.24 The Effect Sizes

Dependent Variable	Multiple Correlation (R)		
	Analysis 1	Analysis 2	Analysis 3
ACH	0.548	0.413	0.540

The values of R can be interpreted according to Cohen' classification schema. Although Analysis 1 and Analysis 3 have large effect size this values close to the medium effect size. There is a medium effect size in Analysis 2.

4.3 Summary of Results

1) The means and standard deviations of achievement test of school A is 13; school B is 9; school C is 11,6 and school D is 14,6 and also the mean of booklet A is 11,4; booklet B is 12,4 and booklet C is 13,8.

2) Selected 76 items from Students Questionnaire was analyzed by using principle component analysis. The rotated solution yielded 10 interpretable factors, perception of success, instructional activities (student-centered), instructional activities (teacher-centered), out of school activities, socio-economic status, out of school activities II, school climate (bullying), computer, reason for being successful , homework.

3) Before the regression analysis data translated in to first z score and then z score translated in to t score.

4) In regression analysis factor scores were used so before the analysis factor scores were calculated.

5) To understand if there is an influential outlier, Cook's Distance, Mahalanobis's Distance was checked. Multicollinearity was checked to understand if there is a relationship between factor scores each other. And lastly correlations between standardized residual and standardized predicted was checked.

6) Four variables together (SES, PERSUC, HOMEWORK, COMPUTER) explained 30.1 % of the variance in students mathematics achievement.

7) PERSUC and SES have positive effect on mathematics achievements but COMPUTER and HOMEWORK have negative effect on mathematics achievements.

8) The equation for the first model is : $Y = 0.390\ X_1 + 0.343\ X_2 - 0.191\ X_3 - 0.150\ X_4$ (Where Y represents the predicted mathematics achievement, and X_1, X_2, X_3, X_4 represents socio- economic status, perception of success, homework, and computer respectively).

9) Other variables, STUACT, TEACACT, OUTOFSCH I, OUTOFSCH II, BULLYING, and SUCCESS, was excluded from the equation because they do not have significant contribution to variance in mathematics achievement for the first model.

10) Three variables together (SES, PERSUC, HOMEWORK) explained 17 % of variance in students reasoning level mathematics achievement.

11) SES and PERSUCC, have positive relationship with students reasoning level mathematics achievement in contrast HOMEWORK has negative relation.

13) The equation for the reasoning level mathematics achievements is $Y = 0.280\ X_1 + 0.276\ X_2 - 0.145\ X_3$ (Where Y represents the predicted mathematics achievement, and X_1, X_2, X_3, represents socio- economic status, perception of success, and homework respectively).

14) Other variables, STUACT, TEACACT, OUTOFSCH I, OUTOFSCH II, BULLYING, SUCCESS, and COMPUTER are excluded from the equation because they do not have significant contribution to variance in reasoning level mathematics achievement.

15) Basic mathematical knowledge level 30 % of variance of achievements explained by the four variables together (SES, CPERSUC, HOMEWORK, and COMPUTER).

16) PERSUC and SES have positive effect on basic mathematical knowledge level mathematics achievements but COMPUTER and HOMEWORK have negative effect on basic mathematical knowledge level mathematics achievements.

17) The equation for basic mathematical knowledge level is: $Y = 0.383\ X_1 + 0.332\ X_2 - 0.183\ X_3 - 0.178\ X_4$ (Where Y represents the predicted mathematics achievement, and X_1, X_2, X_3,X_4 represent socio- economic status, perception of success, homework, and computer respectively).

18) Other variables, STUACT, TEACACT, OUTOFSCH I, OUTOFSCH II, BULLYING, and SUCCESS, are excluded from the equation because they do not

have significant contribution to variance in basic mathematical knowledge level mathematics achievement.

19) According to Cohen' classification schema, although Analysis 1 and Analysis 3 have large effect size this values close to the medium effect size. There is a medium effect size in Analysis 2.

CHAPTER 5

DISCUSSION, IMPLICATIONS AND RECOMMENDATIONS

This chapter includes discussion and interpretation of the results, some implications and recommendations for further research. In the first section restatement of some results and discussion of the results are given. In the second section internal and external validity of the study are discussed and, finally some implications and some recommendations are made in the third section.

5.1 Discussion and Conclusion

The main purpose of this study was to investigate the variables that influence mathematics achievement of students based on TIMSS 2003 student questionnaire and achievement instruments. The data which were used in the present study were collected from four locally, socially and economically different elementary schools in Ankara. The multiple linear regression analysis was carried out in analyzing the data. In this section results of these analyses will be discussed.

Table 4.5 displays correlations for the students' background and school variables. SES, and PERSUCC SUCCESS were positively correlated with mathematics achievement, on the other hand COMPUTER, and HOMEWORK were negatively correlated with mathematics achievement.

According to regression result of the study socio-economic status have a significant effect on mathematics achievement. The fact that socio- economic status was the first variable to enter the regression equation, accounting for 13.7 % of the variance in students mathematics achievement indicates that mathematics achievement can be partly explained by the parent education level, home possessions such as computer and study desk, number of books at home, doing job at home and

expected educational level. The results of the study agreed with Wöbmann (2005) who measured SES with parents' educational level and number of book at home and he explained variance ranged from 10.2 % and 16.9 % in five countries. Also Wang (2004) found that 32 % of Hong Kong and 34 % of US students' mathematics achievement significantly related to family background indicators. The same strong relation was found between home- family background characteristics and mathematics achievement by Bos and Kuiper (1999); Yayan and Berberoğlu (2004) and Hammouri (2004).

Therefore it is apparent from above findings that SES is a strong predictor of the mathematics achievement. Mathematics achievement may be influenced by the SES in several ways such as parents' aspiration and expectation, parenting style, amount of parents' time spent with their children's to help them for their lessons, doing job at home, and working, parental responsive and adequate control of their children. All of these items should have great impact on students' mathematics achievement. It can be interpreted that students with high socio economic status might have access to financial-social and cultural resources which are important for their academic improvement and personnel growth. More educated parents and greater financial sources supply better psychical conditions as living environment, health care, better parental guidance for their life and school carrier. There are students in Turkey still do not or cannot attend in secondary school and further education after elementary school. This is mostly because their parents do not permit them to continue as they believe it is not worth going on further education or they are not able to afford them to continue. Parents' educational level and economic level are also important for students' mathematics achievement. More educated parents are aware of the importance of mathematics achievement and they provide their children more opportunity to learn about mathematics. They support their students even by their knowledge or other ways and they are more able to complete their students' deficiencies. Students who do much work at home could not have much time to study, so this may affect their mathematics achievements negatively. Therefore it can be jugged that students with higher SES are more likely to have higher achievement in mathematics. In addition SES influences the students' perception of success. Students with higher SES have more competence in mathematics and their perception of mathematics easiness make them more successful than their peers. As a

consequence, it is not surprising for mathematics to be powerfully influenced by SES.

When regression analysis was conducted separately for both reasoning level and basic mathematical knowledge level, the results show that SES was also a predictor of mathematics achievements for both levels. Therefore SES is independent from student level of mathematical knowledge and has a powerful effect on mathematics achievements.

Similar to SES, perception of success also appears to be related to mathematics achievement. It accounts for the 10.4 % of the variance of the mathematics achievements at least partly explained by students' confidance in mathematics, their perception of difficulties, self beliefs in mathematics, and attitudes in mathematics success attribution to luck, ability or hard-work. Importance given to mathematics by the students is a significant predictor of mathematics achievement (Bos and Kuiper, 1999; Ma, 1997; and Webster and Fisher, 2000), and there is a reciprocal relationship between attitudes and mathematics achievements (Tağ, 2000). And also students who attribute success in mathematics at hard work get higher mathematics score than students who attribute success in mathematics to luck and natural ability (House, 2006; Kifer, 2002; Hammouri, 2004; Tağ, 2000). In addition students who think to do well in mathematics are important gets higher mathematics score (Hammouri, 2004). Confidance in mathematics ability and perception of failure were found to be the most important variables in mathematics achievements by Yayan and Berberoğlu (2004) and Hammouri(2004) also found positive direct effect of confidance in mathematics on mathematics achievements. The student who believe s/he usually does well in mathematics is more successful in mathematics (Wilkins, 2004). But the relationships between mathematics achievement and attitude towards mathematics could not be found by Papanatasiou (2000.

In the current study perception of success entered into the regression equation, predicting mathematics achievement only after SES. Therefore, the finding of perception of success is another important predictor of mathematics achievement that suggests students' confidance in mathematics, perception of easiness, success attribution, self concepts, self beliefs which are components of perception of success and increase mathematics achievement.

It is apparent that perception of success is also an important predictor of the mathematics achievement and there is a positive relationship between perception of success and mathematics achievement. These findings suggest that students who believe mathematics is an easy subject and learning mathematics is enjoyable, want to take more mathematics lessons in school, also they want to have a job that involved in mathematics may be more successful in mathematics. On the other hand, students who think they are not talented in mathematics and mathematics is a boring subject may be less successful. Most of the people believe that mathematics is a subject which is succeeded by people having ability to do it, so everyone can not be successful in mathematics. Most of the students especially whose mother or father or both have difficulties in mathematics comes to mathematics classes with this prejudice.

When regression analysis was conducted separately for both reasoning level and basic mathematical knowledge level, the results show that perception of success was also a predictor of mathematics achievements for both levels. Therefore perception of success is independent from student level of mathematical knowledge and has a powerful effect on mathematics achievements.

In contrast to SES and perception of success, homework has negative effect on mathematics achievements. In the present study homework explains the additional % 3.8 variance. Although meaningful homework could predict a significant proportion of variance (Revak, 1997), frequency of homework is substantially related to achievements gain in mathematics (Trautwein et. al., 2002). In contrast Jaan (2006) did not found positive relationship between homework and students mathematics achievements even he found negative effect on TIMSS results. The results of the previous study agree with Jaan's (2006) results. It can be interpreted that students checking eachothers' homework, review of homework, discussing completed homework have negative relation with mathematics achievements. There may be many reasons for the negative effect of homework on students' mathematics achievements. One of them is that students may not do their homework, their parents or maybe their bother/sister does it or they may do it in the class by taking from their friends. Another reason may be teachers can not consider homework or they do not give homework or in contrast they give much. In addition to regression analysis to understand frequency of homework's effect on mathematics achievements One Way

Anova have been conducted. These results show that students whose teacher gives homework less then once a week get highest achievement. There is a mean difference between mathematics achievement scores of students who takes homework less then once a week and students who takes homework every day and three or four times a week. It can be interpreted that homework is an important and influential factors for mathematics education.

When regression analysis was conducted separately for both reasoning level and basic mathematical knowledge level, the results show that homework was also a predictor of mathematics achievements for both levels and it has negative effect on mathematics achievement in each level.

Similar to homework, computer has negative effect on mathematics achievements and explains 2.2 % additional variance. The less the students use computer in their classrooms the higher their mathematics scores are, and the highest mean generally belongs to students who has never used computers (Papanastasiou , 2002c; Pelgrum and Plomp, 2002). Students who had computer at home tended to perform better prior to any intervention and intervention with computer based on Tangrams facilitating geometric learning, but there is no significant interaction between computer ownership and computer instruction interaction influencing students score on learning geometry (Olkun et.al., 2005). Students most widely used application of computer in games/adventures, and for school computer is used in word processing (Lewin, 2004; Haris, 1999). In the study computer measured by the observed variable of using computer for look up ideas both for mathematics and science and process and analyze data. It should be interpreted that students do not use computer for this reason and they use it mostly for their leisure time activities. Another possible explanation is that students do take things from the computer instead of creating or producing it.

When regression analysis was conducted separately for both reasoning level and basic mathematical knowledge level, the results show that computer was also a predictor of mathematics achievement for basic mathematical knowledge levels and it has negative effect but it is not a predictor of reasoning level.

The analysis of the current study does not found significant contribution of instructional activities both students centered activities and teacher centered activities on the mathematics achievement. In their study Yayan and Berberoğlu (2004) found

student centered activities had negative effect on mathematics achievements but in contrast they found teacher centered activities had positive weak effect on mathematics achievement. It should be suggested that involving in projects, working in a small group, explain answers discussing daily life problem or practical problem, do not have effect on mathematics achievement. The possible explanation of these is that students centered activities is not used at the classes or can not be used properly. This may be because the teachers do not know how to use it properly or they may not believe its beneficial influence. Teachers can not give feedback and enough help in developing mathematics projects and may not conduct efficient work for group studies in classes. And using lecture style presentation, teachers' explanation of rules, showings how to do problems do not have effect on mathematics achievements. The possible explanation of teacher centered activities is that students may not listen to their teacher while s/he is explaining the rules and definitions, showing how to do problems and they only copy notes from the board. Or another explanation may be that students memorize the explanations and rules and they forget them eventually or only memorize and do not know how to use where to use these rules.

According to the result of the present study out of school activities constitute another variable which had no significant contribution to the variance in students' mathematics achievements. In the literature taking extra curricular activities, TV time (Yayan & Berberoğlu, 2004), skipping class, and students' absenteeism associated with lower mathematics achievements (Wang, 2004; Birenbaum et. al, 2005). Watching TV, playing computer games, using internet, talking or playing with friends outside of the school, playing sports do not have impact on mathematics achievements. Actually out of school activities should take time and students who involve these activities more do not left enough time for study. In the current study the relationship could not found between the out of school activities and mathematics achievement. It may be concluded that student do not spent much time for doing these activities. And also students do not go art exhibition or museum, theater, cinema and concert.

In this study school climate did not explain a significant amount of variance in students' mathematics achievements. This result agreed with the study of Boss and Kuiper (1999) that showed no relationship between school climate and students'

mathematics achievements. Students' missing the lessons, hurt each other, left out of activities, called name or made fun do not have effect on mathematics achievements. The possible explanation may be that; these students live near the school and similar things may be occurring in their environments so they familiar with them or in contrast these things do not occur in their school, this means may be that there is not safety problems in the schools.

Finally, the variable reason for being successful did not contribute the variance of mathematics achievements. According to study which was conducted by Kifer (2002) reasons for doing well vary substantially across systems and students. In the systems with the highest cognitive score students are more likely to want to do well to get into a preferred school than other reasons. In the present study it is measured that students need to be successful in mathematics aimed to go to university or secondary school which they choice, to make themselves happy or to make their family happy, and to get the job they want. It should be concluded that these reasons do not have any effect on mathematics achievements.

5.2 Internal and External Validity

5.2.1 Internal Validity

If there is any relationship observed between two or more variables should be unambiguous as to what it means rather than being due to something else in a study this means this study have internal validity. The something else may be one (or more) number of factors such as age or ability of the subject, or the type of materials used (Frankel & Wallen, 1996). Subject characteristics threats refer to the selection of people for a study from one another in unintended ways that are related to the variables to be studied (Frankel & Wallen, 1996). In the present study subject characteristics are not the problem. Although there were 7^{th} grade students most of the students were 8^{th} grade.

Loss of subjects as the study progress is known as mortality threat (Frankel & Wallen, 1996).In the present study mortality could not be a problem for the internal validity. Achievement tests and questionnaires were assessed at the same day in the same school in their regular lessons. At the first lesson time all students took

achievement test and the following lesson they take questionnaire. And also subjects were not known when they were given questionnaire and achievement test.

Particular locations in which data are collected or intervention is carried out are called location threat (Frankel & Wallen, 1996). The classroom settings in which data were collected were similar to each other so in the present study location is not a problem for the internal validity.

The way of using the instruments may also constitute a threat to internal validity (Frankel & Wallen, 1996). Instrument decay, data collector characteristics and data collector bias could not be a problem for the recent study. All data read by the researcher, data collector characteristics were not related to the variables being investigated and data were collected in the same way from all schools.

Testing, Hawthorne effect, regression, implementation, could not be a problem for the present study because it is not an intervention or experimental study. There were not any unplanned occasions during the implementation of the attitude scales and achievement tests history nor there was a problem for the internal validity. Confidentiality was satisfied without taking accounts the names of the subjects.

5.2.2 External Validity

5.2.2.1 Population Validity

Random sampling was not utilized in the present study; however four different schools included in the study. Generalization of the study was limited because sample size was not big enough. But still generalizability can be done for the subjects who have the same characteristics mentioned in chapter 3.

5.2.2.2 Ecological Validity

The ecological validity refers to the degree to which results of a study can be extended to other settings or conditions, implementations. (Frankel & Wallen, 1996). The results of the study can be generalized to schools similar to this study.

5. 3 Limitations

The simplified model explained the 30.1 % of the variance in mathematics achievements. According to Cohen and Cohen (1983) this amount can be considered

meaningful in behavioral science (as cited Ma, 1997). In the current study 10 variables used in students' level and four of them involved in the model. There may other variables exist at the school level that have potential effect on mathematics achievements such as disciplinary climate, teacher qualification, and school mean of SES, assessment practice, learning materials, and more. There are to some point to strength in the study that lend future credibility to the results, such as use of national data, and of structural equation modeling and the specification of both direct and indirect effects of the factors. The mediated effects models are more robust and reflect the complexity of relationships among the various factors composed with models in which only direct effects are hypothesized.

5.4 Implications

According to findings of the study and the literature review the following suggestion can be offered:

1) Students with lower socio-economic status should be provided educational resources and opportunities.
2) Teachers and parents should emphasize the importance of mathematics to increase students' interest for mathematics.
3) Teachers should be informed about how to use teaching methods' effectively and how to improve their knowledge, how to select appropriate methods that are proper for their classes.
4) Teachers should be guided about how to use effectively various teaching methods in their classes and first of all they should be persuaded about effectiveness of these methods.
5) Parents should be more involved in their students' educational process. They should also be given necessary information to make them aware of the importance of education and also mathematics achievements.
6) Parents also should be given information about their children's social and cognitive growth process and should be informed how they can be effective in this process; how they can give their children a better parental guidance for their school carrier and mathematics carrier.
7) Educational policy makers should make the requiring regulations more seriously considering the given amount of homework in schools.

8) To make it more effective homework should be planned. Generally homework is given to whole classes but individually given homework or homework which needs creativity may have more positive effect on mathematics achievements.
9) Teachers should be given necessary information about effective use of computer for mathematics lessons.

5.5 Suggestion for Further Research

Further research is recommended to adopt multilevel regression to examine individual learning in nation level and also in the hierarchical structure of sociological context.

Second as with any modeling approach replication are required. This means further examination of the students and school related factors with different grade levels, multiple achievements measures and new sample of students at different grade level may be provide better understanding of the role of these factors on school learning in general and in particular on mathematics learning.

Finally, much is still be revealed by regarding determinants of mathematics achievements and process through which these determinants affect achievement in mathematics. Further research is needed to illuminate these issues and the efforts to find the most appreciate intervention taking into account contextual, cultural, and personal factors.

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APPENDIX A

STUDENTS QUESTIONAIRES ITEMS

Tanıtım Bilgileri
Okul:
Sınıf:
Adı-Soyadı:

Genel Açıklamalar

Bu kitapçıkta kendinizle ilgili sorular bulacaksınız. Bazı sorular geçekleri sorarken diğer sorular sizin düşüncenizi sormaktadır.

Her soruyu dikkatlice okuyunuz ve mümkün olduğunca doğru ve dikkatli bir şekilde cevap veriniz. Bir şeyi anlamadığınızda veya nasıl cevap verileceğinden emin olmadığınızda yardım isteyebilirsiniz.

Soruların bazıları birkaç seçenekli olup bu tür sorularda sorunun yanında veya altında harf ile belirtilmiş seçenekler vardır. Bu tür sorularda örnek 1,2,3 te gösterildiği gibi seçtiğiniz cevabı doldurun.

Örnek: 2

Aşağıdaki şeyleri ne sıklıkta yapıyorsunuz?

Her satır için A,B,C,D *veya* E *harflerinden birini daire içine alınız.*

	Her Gün	*Haftada bir kere*	*Ayda bir veya iki kere*	*Yılda birkaç kere*	*Asla*
a) Müzik dinlerim	A	B	C	D	E
b) Spor yaparım	A	B	C	D	E

Her soruyu dikkatle okuyun ve size göre doğru olduğunu düşündüğünüz cevabı seçin. Cevabınızın altında veya yanında olan seçeneği işaretleyin. Eğer cevabınızı değiştirirseniz eski cevabınızı silin ve yeni cevabınızın yanında veya altında olan seçeneği işaretleyin. Bir şeyi anlamadığınızda veya nasıl cevap vereceğinizden emin olmadığınızda yardım isteyebilirsiniz.

Bu anketi doldurmak için ayırdığınız zaman, çaba ve fikirleriniz için teşekkürler.

1. Normal bir okul gününde, okuldan sonra aşağıdaki işleri yapmaya ne kadar zaman harcarsınız?
Her satır için A,B,C,D *veya* E *harflerinden birini daire içine alınız.*

	Zaman yok	*1 saatten az*	*1-2 saat*	*3-5 saat*	*5 saatten fazla*
a) Televizyon veya video izleme	A	B	C	D	E
b) Bilgisayar oyunları oynama	A	B	C	D	E
c) Okul dışında arkadaşlar ile oynama ve konuşma	A	B	C	D	E
d) Ede iş yapma	A	B	C	D	E
e) Spor yapma	A	B	C	D	E
f) Zevk için kitap okuma	A	B	C	D	E
g) Ödev yapma	A	B	C	D	E
h) İnternet kullanma	A	B	C	D	E

2. Anneniz ne kadar süre okula gitti?
A,B,C,D,E,F,G *harflerinden birini daire içine alınız.*

İlköğretim terk veya hiç okula gitmedi..... A
İlköğretimi bitirdi…… B
Lise terk…… C
Lise bitirdi……..... D
Liseden sonra bir süre mesleki teknik eğitim aldı……..... E
Üniversite terk……. F
Üniversite bitirdi…….. G
Bilmiyorum……..... H

3. babanız ne kadar süre okula gitti?
A,B,C,D,E,F,G *harflerinden birini daire içine alınız.*

İlköğretim terk veya hiç okula gitmedi..... A
İlköğretimi bitirdi…… B
Lise terk…… C
Lise bitirdi……..... D
Liseden sonra bir süre mesleki teknik eğitim aldı……..... E
Üniversite terk……. F
Üniversite bitirdi…….. G
Bilmiyorum……..... H

4. Ne kadar süre okula devam etmeyi düşünüyorsunuz?
A,B,C,D,E ve F *harflerinden birini daire içine alınız.*

Liseye kadar…….	A
Liseyi bitirene kadar……	B
Liseden sonra bir mesleki / teknik eğitime kadar…….....	C
Liseden sonra üniversiteye kadar…….	D
Üniversiteyi bitirene kadar…….....	E
Bilmiyorum…….	F

5. Evinizde yaklaşık kaç adet kitap var? *(dergileri gazeteleri veya okul kitaplarını hesaba katmayın)*
A,B,C,D, ve E *harflerinden birini daire içine alınız.*

Hiç ve çok az (0 – 10 saat)……	A
Bir rafı doldurmaya yetecek kadar (11 – 25 kitap)……	B
Bir kitaplığı doldurmaya yetecek kadar (26 – 100 kitap)……...	C
İki kitaplığı doldurmaya yetecek kadar (101 – 201 kitap)……..	D
Üç veya daha fazla kitaplığı doldurmaya yetecek kadar (200'den fazla)...	E

6. Evinizde aşağıdakilerden herhangi biri var mı?
Her seçenek için A *veya* B*'den birini daire içine alın.*

	Evet	*Hayır*
a) Hesap makinesi	A	B
b) Bilgisayar	A	B
c) Çalışma masası / size ait masa	A	B
d) Sözlük	A	B

7. Matematik dersinde…
Her satır için A,B,C, *veya* D *harflerinden birini daire içine alınız.*

	Kesinlikle Katılıyorum	*Katılıyorum*	*Katılmıyorum*	*Kesinlikle Katılmıyorum*
a) Hesap makinesi	A	B	C	D
b) Bilgisayar	A	B	C	D
c) Çalışma masası / size ait masa	A	B	C	D
d) Sözlük	A	B	C	D

8. Okulda Matematikte genellikle ne kadar iyisiniz?
A,B,C, *veya* D *harflerinden birini daire içine alınız.*

	Kesinlikle Katılıyorum	*Katılıyorum*	*Katılmıyorum*	*Kesinlikle Katılmıyorum*
a) Ben genellikle matematikte başarılıyım	A	B	C	D

9. Matematiğin ne kadar zor olduğunu düşünüyorsunuz?
(matematik öğrenmek hakkında verilen ifadelere ne kadar katılıyorsunuz?)
Her satır için A,B,C, *veya* D *harflerinden birini daire içine alınız.*

	Kesinlikle Katılıyorum	*Katılıyorum*	*Katılmıyorum*	*Kesinlikle Katılmıyorum*
a) Genellikle matematikte iyiyimdir	A	B	C	D
b) Okulda daha çok matematik dersi almak istiyorum	A	B	C	D
c) Sınıf arkadaşlarımın birçoğuna kıyasla, benim için matematik daha zor	A	B	C	D
d) Bazen matematikte ilk başta yeni bir konuyu anlamadığımda, bunu gerçekten anlayamayacağımı bilirim	A	B	C	D
e) Matematik benim güçlü anlarımdan biri değildir	A	B	C	D
f) Bu kadar zor olmasaydı matematikten daha çok hoşlanırdım	A	B	C	D
g) Hiç kimse her konuda iyi olamaz ve ben matematikte yetenekli değilim	A	B	C	D
h) Matematikteki şeyleri çabuk öğrenirim	A	B	C	D

10. Ne kadar hoşlanırsınız…..
Her satır için A,B,C, *veya* D *harflerinden birini daire içine alınız.*

	Çok Hoşlanırım	*Hoşlanırım*	*Hoşlanmam*	*Hiç Hoşlanmam*
a) Matematikten?	A	B	C	D
b) Fen bilgisinden?	A	B	C	D

11. Matematik hakkında ne düşünüyorsunuz?
Her satır için A,B,C, *veya* D *harflerinden birini daire içine alınız.*

	Kesinlikle Katılıyorum	*Katılıyorum*	*Katılmıyorum*	*Kesinlikle Katılmıyorum*
a) Matematik öğrenmekten zevk alırım	A	B	C	D
b) Matematik sıkıcıdır	A	B	C	D
c) Matematik kolay bir konudur	A	B	C	D
d) Matematik herkesin yaşamı için önemlidir	A	B	C	D
e) Matematiğin kullanıldığı bir iş isterdim	A	B	C	D

12. Aşağıdakiler için matematikte başarılı olmaya ihtiyaç duyarım…
Her satır için A,B,C, *veya* D *harflerinden birini daire içine alınız.*

	Kesinlikle Katılıyorum	*Katılıyorum*	*Katılmıyorum*	*Kesinlikle Katılmıyorum*
a) İstediğim işi elde etmek için	A	B	C	D
b) Ailemi mutlu etmek için	A	B	C	D
c) Seçtiğim liseye ve ya üniversiteye girebilmek için	A	B	C	D
d) Kendimi mutlu etmek için	A	B	C	D
e) Matematik öğrenmenin günlük yaşamda bana yardımcı olacağını düşünüyorum	A	B	C	D
f) Matematiğe diğer okul konularını öğrenmek için ihtiyaç duyarım	A	B	C	D

13. Matematik dersinde aşağıdakiler ne sıklıkta meydana gelir?
Her satır için A,B,C, *veya* D *harflerinden birini daire içine alınız.*

	Kesinlikle Katılıyorum	*Katılıyorum*	*Katılmıyorum*	*Kesinlikle Katılmıyorum*
Her gün	A	B	C	D
Haftada üç veya dört kez	A	B	C	D
Haftada bir iki kez	A	B	C	D
Haftada bir kereden az	A	B	C	D
Hiçbir zaman	A	B	C	D

14. Matematikte yeni bir konuya başladığımızda şu şekilde başlarız…
Her satır için A,B,C, *veya* D *harflerinden birini daire içine alınız.*

	Hemen her zaman	*Oldukça sık*	*Ara sıra*	*Hiç*
a) Öğretmenin kuralları ve tanımları açıklamasıyla	A	B	C	D
b) Günlük yaşam ile ilgili bir pratik veya öykülü problemi tartışarak	A	B	C	D
c) Bir problem veya proje üzerinde çiftler veya küçük gruplar halinde birlikte çalışarak	A	B	C	D
d) Öğretmenin yeni konu ile ilgili ne bildiğimizi sormasıyla	A	B	C	D
e) Öğretmen yeni konu hakkında konuşurken ders kitabına bakarak	A	B	C	D
f) Yeni konu ile ilgili bir örneği çözmeye çalışarak	A	B	C	D

15. Bu olaylardan herhangi biri geçen ay okulunuzda ne sıklıkta meydana geldi?
Her satır için A,B,C, *veya* D *harflerinden birini daire içine alınız.*

	Hiç	*Bir veya iki kez*	*3-4 kez*	*5 veya daha fazla*
a) Bir ders kaçırdım	A	B	C	D
b) Bana ait bir şey çalındı	A	B	C	D
c) Bana başka bir öğrencinin zarar vereceğini sandım(verdi)	A	B	C	D
d) Bazı arkadaşlarım dersleri kaçırdı	A	B	C	D
e) Bazı arkadaşlarımın eşyaları çalındı	A	B	C	D
f) Arkadaşlardan bazılarına diğer öğrenciler zarar verdi	A	B	C	D
g) Diğer öğrenci(ler) bana vurdu veya yaraladı *incitti*(vurmak, tekme atmak, itmek vb.)	A	B	C	D
h) Diğer öğrencilerle yapmak istemediğim şeyleri yaptım	A	B	C	D
i) Bana takma ad takıldı veya benimle dalga geçildi	A	B	C	D
j) Diğer öğrenciler beni aktivitelerin dışında tutular	A	B	C	D

16. Okul dışında bu faaliyetleri ne sıklıkta yaparsınız?

Her satır için A,B,C, *veya* D *harflerinden birini daire içine alınız.*

	Yaklaşık her gün	*Haftada yaklaşık bir kez*	*Ayda yaklaşık bir kez*	*Nadiren*
a) Bir kitap veya dergi okumak	A	B	C	D
b) Bir müzeyi veya sanat sergisini ziyaret etmek	A	B	C	D
c) Bir konsere katılmak	A	B	C	D
d) Tiyatroya gitmek	A	B	C	D
e) Sinemaya gitmek	A	B	C	D

17. Okul dışında aşağıdaki televizyon veya video program çeşitlerini ne sıklıkta izlersiniz?

Her satır için A,B,C, *veya* D *harflerinden birini daire içine alınız.*

	Yaklaşık her gün	*Haftada yaklaşık bir kez*	*Ayda yaklaşık bir kez*	*Nadiren*
a) Haberler veya belgeseller	A	B	C	D
b) Opera, bale veya klasik müzik	A	B	C	D
c) Doğa,vahşi yaşam veya tarih	A	B	C	D
d) Popüler müzik	A	B	C	D
e) Spor	A	B	C	D
f) Video oyunları	A	B	C	D
g) Çizgi filimler	A	B	C	D
h) Komedi, macera veya polisiye	A	B	C	D

18. Bilgisayarı nerde kullanırsınız?

Her seçenek için A *veya* B*'den birini daire içine alın.*

	Evet	*Hayır*
a) Evde	A	B
b) Okulda	A	B
c) Bir kütüphanede	A	B
d) Bir arkadaşın evinde	A	B
e) Bir internet kafede	A	B
f) Herhangi bir yerde	A	B

19. Bu şeyleri hangi sıklıkla bilgisayarda yaparsınız?
Her satır için A,B,C,D *veya* E *harflerinden birini daire içine alınız.*

	Her Gün	*En az haftada bir*	*Ayda bir veya iki kez*	*Yılda birkaç kere*	*Asla*
a) Matematikle ilgili fikir ve bilgilere bakmak için	A	B	C	D	E
b) Fen ile ilgili fikir ve bilgilere bakmak için	A	B	C	D	E
c) Okulla ilgili raporlar yaparım	A	B	C	D	E
d) Bilgileri analiz etmek ve işlemden geçirmek için	A	B	C	D	E

APPENDIX B

DESCRIPTIVE STATISTICS OF ITEMS OF THE DATA

Item	Min	Max	Mean	SD	Skewness	Kurtosis
Watching tv and videos	1	5	2,55	0,88	0,16	0,08
playing computer games	1	5	1,76	0,97	1,33	1,41
playing or talking with friends	1	5	2,14	2,14	0,59	-0,08
doing jobs at home	1	5	1,85	0,86	0,84	0,18
playing sports	1	5	2,28	0,99	0,59	0,11
use the internet	1	5	1,74	1,06	1,45	1,33
higher education level of mother	1	7	2,85	1,65	1,33	0,64
higher education level of mother	1	7	3,38	1,79	0,78	-0,81
How far in school do you expect to go	1	6	4,74	0,90	-2,32	5,49
books at home	1	5	2,59	1,08	0,57	-0,21
study desk/ table for your use	1	2	1,83	0,37	-1,80	1,23
doing what teachers say	1	4	2,57	0,90	0,01	-0,78
successful in mathematics	1	4	2,68	0,82	0,02	-0,63
do well in mathematics	1	4	2,67	0,87	0,01	-0,78
want takie more mathematics	1	4	2,89	0,88	-0,26	-0,83
more difficult for me than others	1	4	2,40	0,87	0,02	-0,70
I will never really understand it.	1	4	2,45	0,97	0,09	-0,96
not one of my strengths	1	4	2,45	0,97	0,05	-0,95
liking it if it were not so difficult.	1	4	2,76	1,08	-0,34	-1,17
not talented in mathematics	1	4	2,45	0,99	0,05	-1,04
learning things quickly	1	4	2,58	0,87	0,07	-0,70
How much do you like	1	4	3,02	0,86	-0,72	0,03
enjoy learning mathematics.	1	4	3,06	0,85	-0,54	-0,47
mathematics is boring.	1	4	2,16	0,89	0,44	-0,50
mathematics is an easy subject.	1	4	2,36	1,00	0,32	-0,52
Like job involving mathematics	1	4	2,48	0,96	0,12	-0,94
Successful- to get the wanting job.	1	4	3,49	0,71	-1,37	1,57
Successful-to make family happy	1	4	2,99	0,96	-0,56	-0,73
Successful-to get in to the university	1	4	3,62	0,64	-1,88	3,99
successful making his/her happy	1	4	1,00	0,88	-0,90	-0,08
new topic-teachers explain the rules.	1	4	1,00	0,79	-1,25	0,87
new topic-discuss a practical problem	1	4	2,07	0,93	0,69	-0,27
new topic-work in pairs or small groups	1	4	1,78	0,93	1,07	0,27
new topic-teacher ask what we know	1	4	2,37	0,99	0,34	-0,93
new topic-trying to solve an example	1	4	2,99	0,96	-0,53	-0,78
teacher shows how to do problems.	1	4	3,54	0,66	-1,43	2,05

copying notes from the board	1	4	3,64	0,64	-2,08	4,79
having a quiz or test	1	4	2,58	0,93	-0,01	-0,86
work on mathematics projects	1	4	2,22	0,90	0,45	-0,48
work from worksheets or test book	1	4	2,47	1,02	0,13	-1,09
using a calculator	1	4	1,60	0,79	1,36	1,44
use computer in class	1	4	1,73	0,92	1,18	0,47
use daily life event solving problems	1	4	2,44	0,97	0,03	-0,98
work together in pairs or small groups	1	4	2,20	0,95	0,42	-0,69
teacher gives homework	1	4	3,42	0,76	-1,35	1,63
begin homework in class.	1	4	2,27	0,97	0,29	-0,89
teacher checks homework.	1	4	2,83	0,93	-0,39	-0,71
check each other's homework.	1	4	2,31	1,01	0,30	-0,98
discuss completed homework.	1	4	2,47	1,01	0,07	-1,06
teacher use board.	1	4	3,69	0,63	-2,34	5,71
the teacher uses overhead.	1	4	1,72	0,86	1,22	0,94
listen teacher's lecture-style presentation	1	4	3,49	0,76	-1,62	2,42
Work on problems own our own.	1	4	2,86	0,99	-0,45	-0,86
review homework.	1	4	2,68	0,99	-0,21	-1,01
Frequency of homework	1	4	3,52	0,72	-1,52	2,00
last month	1	5	3,43	0,97	0,13	-0,40
something of mine was stolen	1	4	1,51	0,85	1,69	1,99
thinking other students hurt me	1	4	1,50	0,82	1,74	2,36
last month, students miss the lessons	1	4	2,56	1,01	0,15	-1,12
last month other students hurt my friends	1	4	2,15	0,99	0,60	-0,62
last month I was hit or hurt	1	4	1,57	0,87	1,50	1,36
last month, I was made fun	1	4	1,76	1,02	1,17	0,10
last month, I was left out of activities	1	4	1,38	0,78	2,20	4,11
go to museum or art exhibition	1	4	1,42	0,80	1,93	2,87
join a concert	1	4	1,37	0,74	2,12	3,91
go to theatre	1	4	1,46	0,78	1,74	2,38
go to cinema	1	4	1,85	0,91	0,71	-0,52
popular music programs	1	4	3,20	1,11	-1,11	-0,25
sport	1	4	3,03	1,09	-0,84	-0,61
video games	1	4	2,35	1,24	0,15	-1,60
cartoons	1	4	2,28	1,18	0,18	-1,51
comedy, adventure,	1	4	2,97	1,08	-0,71	-0,79
I use a computer at home	1	2	1,56	0,50	-0,25	-1,94
I look up information for mathematics	1	5	2,76	1,39	0,06	-1,33
I look up information for science	1	5	2,79	1,38	0,03	-1,30
I process and analyze data	1	5	2,53	1,38	0,32	-1,24

APPENDIX C

ITEM ANAYSIS OF QUESTIONAIRE

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
Watching tv and videos	188,7184	307,9491	-0,1811	0,7922
playing computer games	189,4310	292,7091	0,2698	0,7814
playing or talking with friends	189,0460	300,6453	0,0473	0,7870
doing jobs at home	189,3908	301,1527	0,0412	0,7868
playing sports	188,9770	290,7740	0,3443	0,7795
use the internet	189,5287	291,5223	0,2937	0,7806
higher education level of mother	188,3851	291,7410	0,1490	0,7867
higher education level of mother	187,7586	289,7795	0,1635	0,7868
How far in school do you expect to go	186,4023	299,7447	0,1175	0,7850
books at home	188,5805	291,8172	0,2875	0,7808
study desk/ table for your use	189,4080	300,4626	0,1929	0,7844
doing what teachers say	188,7816	296,9231	0,1665	0,7841
successful in mathematics	188,5000	295,8006	0,2346	0,7826
do well in mathematics	188,5230	296,1584	0,2066	0,7831
want takie more mathematics	188,3793	295,7628	0,2150	0,7829
more difficult for me than others	188,9770	303,7567	-0,0493	0,7892
I will never really understand it.	188,8391	301,3497	0,0191	0,7880
not one of my strengths	188,8793	305,4593	-0,1008	0,7907
liking it if it were not so difficult.	188,5920	305,9655	-0,1077	0,7921
not talented in mathematics	188,9425	305,5574	-0,1006	0,7912
learning things quickly	188,6322	295,5518	0,2332	0,7826
How much do you like	188,1322	297,9188	0,1657	0,7841
enjoy learning mathematics.	188,1437	296,4821	0,1988	0,7833
mathematics is boring.	189,1782	307,9854	-0,1847	0,7921
mathematics is an easy subject.	188,8161	297,8735	0,1406	0,7847
Like job involving mathematics	188,6897	297,3482	0,1478	0,7845
Successful- to get the wanting job.	187,7241	298,0969	0,2035	0,7835
Successful-to make family happy	188,2529	294,4097	0,2366	0,7823
Successful-to get in to the university	187,5920	297,8499	0,2445	0,7830
successful making his/her happy	187,9943	295,9595	0,2123	0,7830
new topic-teachers explain the rules.	187,7414	299,7304	0,1065	0,7852
new topic-discuss a practical problem	189,1724	293,3689	0,2884	0,7812
new topic-work in pairs or small groups	189,5287	292,5974	0,3251	0,7804
new topic-teacher ask what we know	188,8908	295,2539	0,2006	0,7832
new topic-trying to solve an example	188,2414	298,8894	0,0937	0,7860

teacher shows how to do problems.	187,7644	301,0944	0,0637	0,7859
copying notes from the board	187,6264	301,0215	0,0635	0,7860
having a quiz or test	188,6264	294,8250	0,2470	0,7822
work on mathematics projects	189,1149	290,5994	0,3658	0,7791
work from worksheets or test book	188,8851	287,9058	0,4010	0,7777
using a calculator	189,7586	296,9356	0,2247	0,7830
use computer in class	189,6092	293,1065	0,2862	0,7811
use daily life event solving problems	188,7874	294,6771	0,2202	0,7827
work together in pairs or small groups	189,0460	292,1828	0,3281	0,7802
teacher gives homework	187,7989	298,5547	0,1433	0,7845
begin homework in class.	188,9540	294,7724	0,2131	0,7829
teacher checks homework.	188,4598	289,5446	0,3941	0,7784
check each other's homework.	188,8103	293,7384	0,2367	0 ,7822
discuss completed homework.	188,7471	291,9126	0,3038	0,7805
teacher use board.	187,5115	300,8178	0,1036	0,7852
the teacher uses overhead	189,6034	295,2696	0,2522	0,7822
listen teacher's lecture-style presentation	187,7759	293,6084	0,3365	0,7806
Work on problems own our own.	188,4368	289,9584	0,3705	0,7788
review homework.	188,6092	296,7250	0,1485	0,7846
Frequency of homework	187,7414	294,7709	0,3093	0,7813
last month	187,8621	295,0098	0,2337	0,7825
something of mine was stolen	189,7356	296,4037	0,2261	0,7828
thinking other students hurt me	189,8448	294,9873	0,2958	0,7815
last month, students miss the lessons	188,6149	306,7931	-0,1355	0,7920
last month other students hurt my friends	189,0287	296,9182	0,1510	0,7845
last month I was hit or hurt	189,6897	294,9898	0,2459	0,7822
last month, I was made fun	189,5460	295,1048	0,2006	0,7832
last month, I was left out of activities	189,8678	298,2425	0,1443	0,7845
go to museum or art exhibition	189,9195	293,6929	0,3593	0,7804
join a concert	189,9713	295,8662	0,3386	0,7815
go to theatre	189,8851	292,5763	0,4399	0,7793
go to cinema	189,4828	290,3899	0,4311	0,7783
popular music programs	188,1264	301,9608	-0,0068	0,7896
sport	188,2241	297,7356	0,1044	0,7861
video games	189,0862	290,2758	0,2704	0,7811
cartoons	189,0402	299,3452	0,0602	0,7875
comedy, adventure,	188,3103	292,3771	0,2523	0,7817
I use a computer at home	189,6954	299,3344	0,1996	0,7839
I look up information for mathematics	188,4483	280,1910	0,4563	0,7741
I look up information for science	188,4540	281,1511	0,4358	0,7749
I process and analyze data	188,6954	282,0049	0,4174	0,7756

APENDIX D

QUESTIONS OF BOOKLET A

Tanıtım Bilgileri
Okul:
Sınıf:
Adı-Soyadı:

Aşağıda verilen sorulardan doğru cevapları seçeneği olanların seçeneğini sorularda doğru seçeneği bularak işaretleyin, çözüm ve açıklama yapmanızın istendiği sorularda boş bırakılan yerlere çözümlerinizi ve açıklamalarınızı yapınız.
Bu test 25 sorudan oluşmaktadır ve cevaplanma süresi bir ders saatidir.

A

SORULAR

1) Cem 3 karton meyve suyuna x zed ödüyor. Bir karton meyve suyunun fiyatı kaç zed'dir?

a) $\frac{x}{3}$ b) $\frac{3}{x}$ c) $3 + x$ d) $3x$

2) 7, 11, 15, 19, 23 sıralamasındaki sayılar 4'er 4'er artıyor. 1, 10, 19, 18, 37 sıralamasındaki sayılar 9'ar 9'ar artıyor. 19 sayısı her iki sıralamada vardır. Eğer sıralamalar devam ederse her iki sıralamada da ortak olacak olan sonraki sayı kaçtır?

Cevap: _____

3) K= 6 olduğunda L= 4 ve M = 24'tür. Aşağıdakilerden hangisi doğrudur?

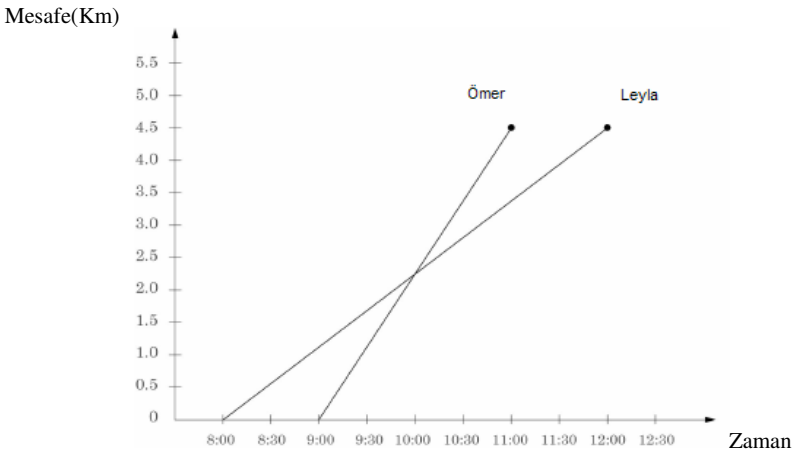
a) $L = \frac{M}{K}$ b) $L = \frac{K}{M}$ c) $L = KM$ d) $L = K + M$ e) $L = M - K$

4) Bir markette 7 portakal ve 4 limon 43 zeds ve 11 portakal ile 12 limon 79 zeds'dir. x'i portakalın fiyatı, y'yi de limonun fiyatı olarak kullanarak x ve y nin değerlerini bulmak için iki tane eşitlik yazın?

Eşitlik 1:_____

Eşitlik 2:_____

5) Grafik Ömer ve Leyla'nın yaptıkları yürüyüşün zamanını ve mesafesini göstermektedir.



Eğer ikisi de aynı yerden aynı yön doğru yürümeye başlarsa ne zaman karşılaşırlar.

a) 8:00 b) 8:30 c) 9:00 d)10:00 e) 11:00

6) x = -3 ise – 3x 'in değeri kaçtır?

a) – 9 b) -6 c) -1 d) 1 e) 9

7) Bu sayıların hangisi 10'a en yakındır?

a) 0.10 b) 9.99 c) 10.10 d) 10.90

8) Ali'nin 4 tur koşabildiği pisti aynı sürede Cem 3 tur koşabilmektedir. Cem12 tur koştuğunda Ali kaç tur koşar?

a) 9 b) 11 c) 13 d) 16

9) Bir öğretmen ve bir doktorun her birinin 45'er kitabı vardır. Eğer öğretmenin kitaplarının 4/5 'i ve doktorun kitaplarının 2/3 'ü roman ise öğretmenin romanlarının sayısı doktorunkinden kaç tan fazladır?

a) 2 b) 3 c) 6 d) 30 e) 36

10)

9	1	4	5

Yukarıdaki dört rakam büyükten küçüğe doğru dört basamaklı sayı oluşturmak için düzenlenmiştir. Aynı dört rakam sonra küçükten büyüğe doğru diğer dört basamaklı sayıyı oluşturmak için düzenleniyor. Bu iki dört basamaklı sayı arasındaki fark nedir.

a) 3726 b) 4726 c) 8082 d) 8182 e) 8192

11) Ayşe ve Can'a bir sayıyı 100'e bölmeleri isteniyor. Yanlışlıkla Ayşe sayıyı 100 ile çarpıyor ve 450 elde ediyor. Can doğru olarak sayıyı 100'e bölüyor. Cevabı nedir?

a) 0.0045 b) 0.045 c) 0.45 d) 4.5

12) $\frac{3}{5} + \left(\frac{3}{10} \times \frac{4}{15}\right) = ?$

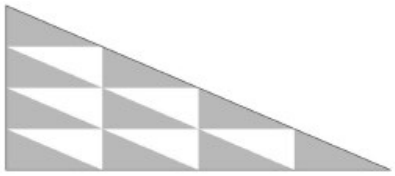
a) $\frac{3}{51}$ c) $\frac{6}{25}$ e) $\frac{17}{25}$

b) $\frac{11}{6}$ d) $\frac{11}{2}$

13) Hangisi 370 x 998 + 370 x 2 ‘ye eşittir?

a) 370 x 1000 b) 372 x 998 c) 740 x 998 d) 370 x 998

14)



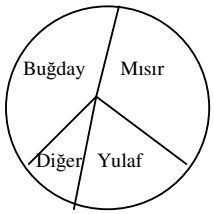
Yukarıdaki üçgende bütün küçük üçgenlerin alanları eşittir. Taralı alanın taralı olmayan alana oranı nedir?

a) 5 : 3 b) 8 : 5 c) 5 : 8 c) 3 : 5

15) Bir bilgisayar Kulübünün 40 üyesi vardır ve üyelerin % 60’ı kızdır. Sonradan 10 erkek Kulübe katılıyor. Şimdi üyelerin yüzde kaçı kızdır?

Cevap: _____

16) Şekil bir ülkede yetiştirilen ürünlerin dağılımını göstermektedir.



Grafikte verilen bilgilere göre verilenlerden hangisi doğrudur?

a) Buğdaya göre daha fazla yulaf üretilmektedir.

b) Mısır ülkenin toplam ürünlerinin yarısından daha fazladır.

c) Yulaf ülkenin mısır miktarının üçte birinden daha fazladır.

d) Buğday ve yulaf’ın toplamı mısırdan daha fazladır

17) Bunlardan hangisi en küçük zaman dilimidir?

a) 1 gün b) 20 saat c) 1800 dakika d) 90 000 saniye

18) Kaynama noktasına kadar ısıtılmış bir deney tüpü su soğumaya bırakılıyor. Suyun sıcaklığı beş dakikalık aralıklarla ölçülüyor ve sıcaklık- zaman grafiği çiziliyor.

İlk 20 derecelik soğuma yaklaşık olarak kaç dakika sürer.

a) 3 b) 8 c) 37 d) 50

19) Bir raly'de iki kontrol noktasının arası 160 km'dir. Sürücüler bir kontrol noktasından diğerine maksimum puanı alabilmek için tam olarak 2,5 saatte gitmek zorundadır.

A) 160 km yi bu sürede gitmek için ortalama hız ne olmalıdır?

Cevap: _____

B) Bir sürücü 40 km'lik dağlık bölümü 1 saatte pistin başlangıcında gidiyor.
Eğer kontrol noktaları arasındaki toplam süre 2,5 saat ise kalan 120 km için saatteki ortalama hızı ne olmalıdır?

Cevap: _____

20) Bir doğru (2,3) ve (4,7) noktalarından geçmektedir. Aşağıdaki noktaların hangisi de bu doğru üzerindedir?

a) (0,2) b) (1,2) c) (2,4) d) (3,5) e) (4,5)

21) Belma, Fırat ve Deniz Zedland'a yeni taşındılar. Her üçünün de telefon bağlatmaya ihtiyaçları vardır. Bir telefon şirketinden iki farklı plan öneren bilgiyi alıyorlar.

Her ay ödemeleri gereken sabit ücret ve her konuştukları dakika için farklı ücretleri vardır. Bu ücretler gece ve gündüz olmasına, telefonu kullandıkları zamana ve hangi ödeme planını seçtiklerine bağlıdır. Her iki plan bedava konuşma süresi içeriyor. İki planın detayları tabloda gösterilmektedir.

PLAN	Aylık Sabit Ücret	Dakika Başına Ücret		Aylık bedava konuşma süresi
		Gündüz (8:00 - 18:00)	Gece (18:00 – 8:00)	
Plan A	20 zeds	3 zeds	1 zed	180
Plan B	15 zeds	2 zeds	2 zeds	120

Belma her ay 2 saatten az konuşuyor hangi plan onun için daha az pahalıdır?

En ucuz plan:

Cevabınızı aylık sabit ücret ve aylık bedava konuşma süresine göre açıklayın.

Fırat bir ayda geceleri 5 saat konuşuyor. Her iki planın maliyeti onun için nedir? Cevabınızı gösterin.

Plan A'nın aylık maliyeti:_____

Plan B'nin aylık maliyeti:_____

Deniz Plan B'yi seçiyor ve bir aylık faturası 75 zeds'dir. Kaç dakika konuşmuştur? Cevabınızı gösterin.

Konuşulan Dakika: _____

22) 20cm uzunluğunda ince bir telden bir dikdörtgen oluşturuluyor. Bu dikdörtgenin genişliği 4cm ise uzunluğu nedir?

a) 5 santimetre b) 6 santimetre c) 12 santimetre d) 16 santimetre

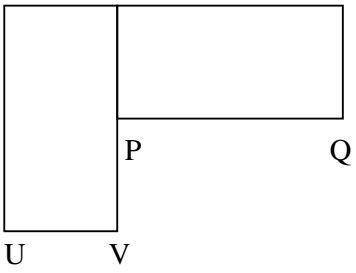
23) Tablo bir sınıfın 10 puanlık testten alınan sonuçları göstermektedir.

Test puanı	**Çetele/ skor**	Görülme sıklığı
4	/	1
5	///	3
6	///// /	6
7	//	2
8	////	4
9	///	3
10	/	1

Sınıfta kaç kişinin sonucu 7 den daha iyidir?

a) 2 b)8 c)10 d)12 e)20

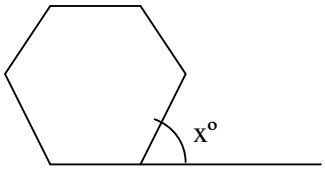
24) PQRS dikdörtgeni UVST dikdörtgeni üzerinde döndürülebiliyor.



Dönme merkezi hangi noktadır?

a) P b) R c) S d) T e) V

25)



Yukarıdaki şekil düzgün altıgendir. X 'in değeri kaçtır?

Cevap: _____

APENDIX E

QUESTIONS OF BOOKLET B

Tanıtım Bilgileri
Okul:
Sınıf:
Adı-Soyadı:

Aşağıda verilen sorulardan doğru cevapları seçeneği olanların seçeneğini sorularda doğru seçeneği bularak işaretleyin, çözüm ve açıklama yapmanızın istendiği sorularda boş bırakılan yerlere çözümlerinizi ve açıklamalarınızı yapınız.
Bu test 25 sorudan oluşmaktadır ve cevaplanma süresi bir ders saatidir.

B

SORULAR

1) Güney'in Burak'ın kitaplarının iki katı kadar kitabı vardır. Cihan'ın Burak'tan 6 tane daha fazla kitabı vardır. Eğer Burak'ın x tane kitabı varsa aşağıdakilerden hangisi bu üç kişinin sahip olduğu toplam kitap sayısını belirtir.

a) $3x + 6$ b) $3x + 8$ c) $4x + 6$ d) $5x + 6$ e) $8x + 2$

2) (3,6) , (6, 15) , (8,12)

Bunlardan hangileri yukarıda sıralanmış olan her ikilinin ikinci sayısının birici sayıdan nasıl elde edildiğini tanımlar.

a)3 ekleyerek b) 3 çıkararak c) 2 ile çarparak

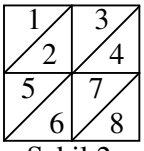
d) 2 ile çarpıp sonra 3 ekleyerek e) 3 ile çarpıp sonra 3 çıkararak

3) Eğer $x - y = 5$ ve $\frac{x}{2} = 3$ ise y'nin değeri nedir?

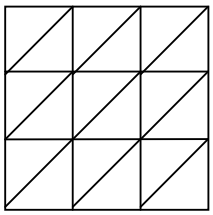
a) 6 b) 1 c) – 1 d) – 7

4) Aşağıdaki şekiller benzer üçgenlere bölünüyor.

Şekil 1



Şekil 2


Şekil 3

A) Aşağıdaki tabloyu tamamlayın. Önce üçüncü şekli kaç küçük üçgenin oluşturduğunu doldurun. Sonra eğer örüntü devam ettirilirse 4. şekil için kaç küçük üçgene ihtiyaç olduğunu bulun.

Şekil	Küçük üçgenlerin sayısı
1	2
2	8
3	
4	

B) Şekillerden oluşan sıralama 7. şekle kadar genişletilirse 7. şekil için kaç küçük üçgene ihtiyaç vardır?

Cevap: _____

C) Şekillerden oluşan sıralama 50. şekle kadar genişletilirse 50. figürdeki küçük üçgenlerin sayısını şekli çizip üçgenleri saymadan bulmanın yolunu açıklayın.

Cevap: _____

5) Eğer $\frac{12}{n} = \frac{36}{21}$ ise n kaçtır?

a) 3 b) 7 c) 36 d) 63

6) $\frac{3x}{7} - \frac{x}{7} =$

a) $\frac{2}{7}$ b) 3 c) 2x d) $\frac{x}{7}$ e) $\frac{2x}{7}$

7) Hangi sayılar büyükten küçüğe doğru sıralanmıştır.

a) 0.233 0.3 0.32 0.332 c) 0.32 0.233 0.332 0.3

b) 0.3 0.32 0.332 0.233 d) 0.332 0.32 0.3 0.233

8) Bir makine her 30 saatlik operasyon için 2.4 litre benzin kullanmaktadır. Makine 100 saat için kaç litre bezin kullanır.

a) 7.2 b) 8.0 c) 8.4 d) 9.6

9) 1:00 ile 1:30 arasında geçen sürenin bir saate oranı kaçtır?

a) $\frac{1}{5}$ b) $\frac{1}{3}$ c) $\frac{1}{2}$ d) $\frac{2}{3}$ e) $\frac{3}{4}$

10 Her hafta 7000'e yakın gazete satılmaktadır. Her yıl yaklaşık kaç gazete satılır.

a) 8400 b) 35 000 c) 84 000 d) 350 000 e) 3 500 000

11) Bir arabanın 45 lt yakıt alabilen deposu vardır. Bu araba her 100 km. de 8.5 lt yakıt tüketmektedir. Tam dolu depo ile 350 km. bir yolculuğa çıkılıyor. Yolculuğun sonunda depoda ne kadar yakıt kalır?

a) 15.25 lt b) 16.25 lt c) 24.75 lt d) 29.75 lt

12) 1- 5 x (-2) 'nin değeri nedir?

a) 11 b) 8 c) – 8 d) – 9

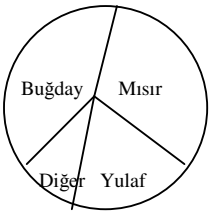
13) Eğer n negatif bir tam sayı ise bumlardan hangisi en büyükt

a) 3 + n b) 3 x n c) 3 - n d) 3 ÷ n

14) Bir bilgisayar klübünün 40 üyesi vardır ve üyelerin % 60'ı kızdır. Sonradan 10 erkek klübe katılıyor. Şimd üyelerin yüzde kaçı kızdır

Cevap: _____

15) Şekil bir ülkede yetiştirilen ürünlerin dağılımını göstermektedir.



Grafikte verilen bilgilere göre verilenlerden hangisi doğrudur?

e) Buğdaya göre daha fazla yulaf üretilmektedir.

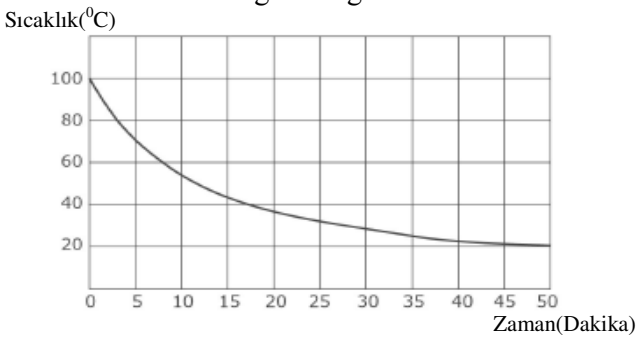
f) Mısır ülkenin toplam ürünlerinin yarısından daha fazladır.

g) Yulaf ülkenin mısır miktarının üçte birinden daha fazladır.

h) Buğday ve yulaf'ın toplamı mısırdan daha fazladır

16) Kaynama noktasına kadar ısıtılmış bir deney tüpü su soğumaya bırakılıyor. Suyun sıcaklığı beş dakikalık aralıklarla ölçülüyor ve sıcaklık- zaman grafiği çiziliyor.

Soğuma Eğrisi



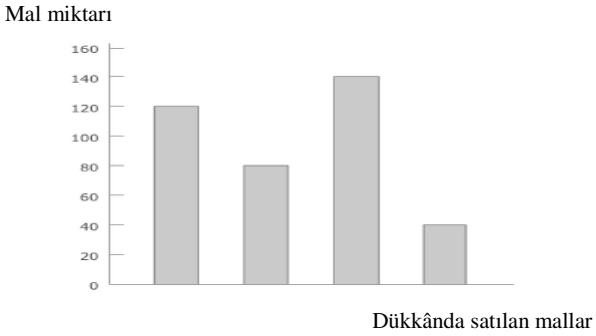
İlk 20 derecelik soğuma yaklaşık olarak kaç dakika sürer.

a) 3 b) 8 c) 37 d) 50

17) 400 litre su ile doldurulan 250 mililitrelik şişelerin sayısı…

a) 16 b) 160 c) 1600 d) 16 00

18) Grafik bir dükkânda bir haftada satılan dolma kalem, kurşun kalem, cetvel ve silgi sayısını göstermektedir.



Satılan malların isimleri grafikte yoktur. Dolma kalem en çok satılan madde ve silgi en az satılan maddedir. Cetvelden çok kurşun kalem satılmıştır. Kaç tane kurşun kalem satılmıştır.

a)40 b)80 c)120 d)140

19) 20cm uzunluğunda ince bir telden bir dikdörtgen oluşturuluyor. Bu dikdörtgenin genişliği 4cm ise uzunluğu nedir?

a) 5 santimetre b) 6 santimetre c) 12 santimetre d) 16 santimetre

20) Mehmet ödevini yapmaya 6:40'ta başlıyor. Mehmet'in ödevini yapması bir saatin üç çeyrek dakikası kadar sürüyorsa saat kaçta ödevini bitirir?

Cevap: _____

21) Belma, Fırat ve Deniz Zedland'a yeni taşındılar. Her üçünün de telefon bağlatmaya ihtiyaçları vardır. Bir telefon şirketinden iki farklı plan öneren bilgiyi alıyorlar.
Her ay ödemeleri gereken sabit ücret ve her konuştukları dakika için farklı ücretleri vardır. Bu ücretler gece ve gündüz olmasına, telefonu kullandıkları zamana ve hangi ödeme planını seçtiklerine bağlıdır. Her iki plan bedava konuşma süresi içeriyor. İki planın detayları tabloda gösterilmektedir.

PLAN	Aylık Sabit Ücret	Dakika Başına Ücret		Aylık bedava konuşma süresi
		Gündüz (8:00 - 18:00)	Gece (18:00 – 8:00)	
Plan A	20 zeds	3 zeds	1 zed	180
Plan B	15 zeds	2 zeds	2 zeds	120

Belma her ay 2 saatten az konuşuyor hangi plan onun için daha az pahalıdır?

En ucuz plan:

Cevabınızı aylık sabit ücret ve aylık bedava konuşma süresine göre açıklayın.

Fırat bir ayda geceleri 5 saat konuşuyor. Her iki planın maliyeti onun için nedir? Cevabınızı gösterin.

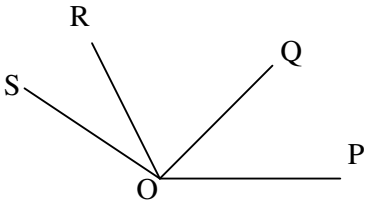
Plan A'nın aylık maliyeti: _____

Plan B'nin aylık maliyeti: _____

Deniz Plan B'yi seçiyor ve bir aylık faturası 75 zeds'dir. Kaç dakika konuşmuştur? Cevabınızı gösterin.

Konuşulan Dakika: _____

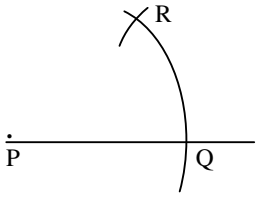
22) Şekilde POR ölçüsü 110° , QOS ölçüsü 90º ve POS açısı 140° dir.



^
QOR ölçüsü kaç derecedir?

Cevap: _____

23)



Yukarıdaki şekilde P merkezli bir çemberin yayı doğruyu Q noktasında kesecek şekilde çiziliyor. Sonra aynı yarıçapa sahip Q merkezli yay ilk yayı R de kesecek şekilde çiziliyor. PRQ açısının ölçüsü nedir?

a) 30° b) 45° c) 60° d)75°

24) Bir raly'de iki kontrol noktasının arası 160 km'dir. Sürücüler bir kontrol noktasından diğerine maksimum puanı alabilmek için tam olarak 2,5 saatte gitmek zorundadır.

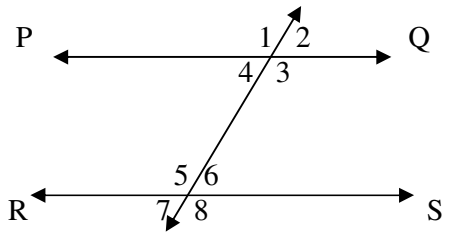
A) 160 km yi bu sürede gitmek için ortalama hız ne olmalıdır?

Cevap: _____

B) Bir sürücü 40 km'lik dağlık bölümü 1 saatte pistin başlangıcında gidiyor.
Eğer kontrol noktaları arasındaki toplam süre 2,5 saat ise kalan 120 km için saatteki ortalama hızı ne olmalıdır?

Cevap: _____

25) Şekilde PQ ve RS paraleldir.



Aşağıdaki hangi açıların toplamı 180º'dir.

a) 5 ve 7 b) 3 ve 6 c)1 ve 5 d)1 ve 7 e)2 ve 8

APENDIX F

QUESTIONS OF BOOKLET C

Tanıtım Bilgileri
Okul:
Sınıf:
Adı-Soyadı:

Aşağıda verilen sorulardan doğru cevapları seçeneği olanların seçeneğini sorularda doğru seçeneği bularak işaretleyin, çözüm ve açıklama yapmanızın istendiği sorularda boş bırakılan yerlere çözümlerinizi ve açıklamalarınızı yapınız.
Bu test 25 sorudan oluşmaktadır ve cevaplanma süresi bir ders saatidir.

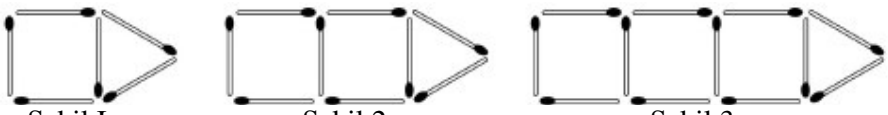
C

SORULAR

1) Eğer $y = 3x + 2$ ise hangisi x'in y cinsinden değerini verir?

a) $x = \frac{y - 2}{3}$ b) $x = \frac{y + 2}{3}$ c) $x = \frac{y}{3} - 2$ d) $x = \frac{y}{3} + 2$

2) Kibrit çöpleri şekilde gösterildiği gibi düzenlenmiştir.



Şekil I Şekil 2 Şekil 3

Örüntü devam ettirilirse 10. şekli yapmak için kaç tane kibrit çöpüne ihtiyaç vardır.

a) 30 b) 33 c) 36 d) 39

3) Eğer $\frac{a}{} = 70$ ise $\frac{a}{} =$

b 2b

a) 35 b) 68 c) 72 d) 140

4) Sami toplamları 84 olan üç ardışık çift sayı bulmak istiyor.
k + (k + 2) + (k + 4) = 84 eşitliğini yazıyor. k neyi belirtiyor?

a) Üç çift sayının en küçüğünü b) Ortanca çift sayıyı
c) Üç çift sayının en büyüğünü d) Üç çift sayının ortalamasını

5) x + 3y = 11 ve 2x + 3y = 18 ise y = ?

a) 3 b) 2 c) -2 d) -3

6) 4(x + 5) = 80 ise x = ?

Cevap: _____

7) Bir oyundaki insanların $\frac{3}{25}$ i çocuktur. Bu çocuk seyircilerin yüzdesi kaçtır?

a) % 12 b) % 3 c) % 0.3 d) % 0.12

8) Bir dükkân fiyatlarını % 20 artırıyor. Önceki fiyatı 800 zeds olan bir malın yeni fiyatı ne olur?

a) 640 zeds b) 900 zeds c) 960 zeds d) 1000 zeds

9) Bir öğrenci grubunda öğrencilerden 16 sının doğum günü yılın ilk yarısında ve 14'ünün doğum günü yılın ikinci yarısındadır. Yılın birinci yarısında doğanların gruba oranı olan kesir hangisidir?

a) $\frac{14}{30}$ b) $\frac{14}{16}$ c) $\frac{16}{14}$ d) $\frac{16}{30}$ e) $\frac{30}{16}$

10) Bir bahçede 14 sıra vardır. Her sırada da 20 bitki vardır. Bahçıvan daha sonra her sırada 20 bitki olacak şekilde 6 sıra daha yapıyor. Şimdi toplam kaç bitki vardır?

Cevap: _____

11) Ali bir yarışı 49.86 saniyede koştu. Betül aynı yarışı 52.30 saniyede koştu. Betül Ali'den ne kadar daha fazla koşmuştur?

a) 2.44 saniye b) 2.54 saniye c) 3.56 saniye d) 3.76 saniye

12) Bir kepçe 1/5 kg un alıyor. 6 kg' lık bir torbayı doldurmak için kaç kepçe una ihtiyaç vardır?

Cevap: _____

13) Hangisi $11^2 + 9^2$ 'sine en yakındır?

a) 20 + 20 b) 20 + 80 c) 120 + 20 d) 120 + 80

14) $\frac{4}{9}$ dan küçük bir kesir yazın.

Cevap: _____

15) Bir bilgisayar kulübünün 40 üyesi vardır ve üyelerin % 60'ı kızdır. Sonradan 10 erkek kulübe katılıyor. Şimdi üyelerin yüzde kaçı kızdır?

Cevap: _____

16) Bir okulda 1200 öğrenci vardır (kızlar ve erkekler) . Rasgele 100 kişilik bir örneklem seçiliyor ve örneklemde 45 erkek bulunuyor. Hangisi okuldaki en olası erkek sayısıdır?

a) 450 b) 500 c) 540 d) 600

17) Hangisi genellikle bir futbol sahasının büyüklüğü için kullanılır.

a) santimetre kare b) santimetre küp c) metre kare d) metre küp

18) Belma, Fırat ve Deniz Zedland'a yeni taşındılar. Her üçünün de telefon bağlatmaya ihtiyaçları vardır. Bir telefon şirketinden iki farklı plan öneren bilgiyi alıyorlar.
Her ay ödemeleri gereken sabit ücret ve her konuştukları dakika için farklı ücretleri vardır. Bu ücretler gece ve gündüz olmasına, telefonu kullandıkları zamana ve hangi ödeme planını seçtiklerine bağlıdır. Her iki plan bedava konuşma süresi içeriyor. İki planın detayları tabloda gösterilmektedir.

PLAN	Aylık Sabit Ücret	Dakika Başına Ücret		Aylık bedava konuşma süresi
		Gündüz (8:00 - 18:00)	Gece (18:00 – 8:00)	
Plan A	20 zeds	3 zeds	1 zed	180
Plan B	15 zeds	2 zeds	2 zeds	120

Belma her ay 2 saatten az konuşuyor hangi plan onun için daha az pahalıdır?

En ucuz plan:

Cevabınızı aylık sabit ücret ve aylık bedava konuşma süresine göre açıklayın.

Fırat bir ayda geceleri 5 saat konuşuyor. Her iki planın maliyeti onun için nedir? Cevabınızı gösterin.

Plan A'nın aylık maliyeti: _____

Plan B'nin aylık maliyeti: _____

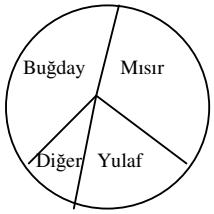
Deniz Plan B'yi seçiyor ve bir aylık faturası 75 zeds'dir. Kaç dakika konuşmuştur? Cevabınızı gösterin.

Konuşulan Dakika: _____

19)20cm uzunluğunda ince bir telden bir dikdörtgen oluşturuluyor. Bu dikdörtgenin genişliği 4cm ise uzunluğu nedir?

a) 5 santimetre b) 6 santimetre c) 12 santimetre d) 16 santimetre

20) Şekil bir ülkede yetiştirilen ürünlerin dağılımını göstermektedir.



Grafikte verilen bilgilere göre verilenlerden hangisi doğrudur?

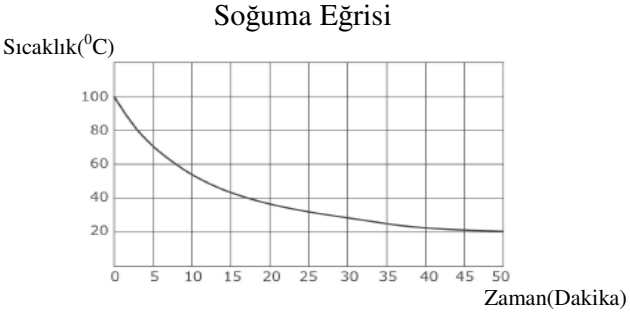
i) Buğdaya göre daha fazla yulaf üretilmektedir.

j) Mısır ülkenin toplam ürünlerinin yarısından daha fazladır.

k) Yulaf ülkenin mısır miktarının üçte birinden daha fazladır.

l) Buğday ve yulaf'ın toplamı mısırdan daha fazladır

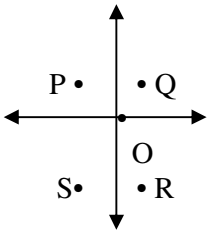
21) Kaynama noktasına kadar ısıtılmış bir deney tüpü su soğumaya bırakılıyor. Suyun sıcaklığı beş dakikalık aralıklarla ölçülüyor ve sıcaklık- zaman grafiği çiziliyor.



İlk 20 derecelik soğuma yaklaşık olarak kaç dakika sürer.

a) 3 b) 8 c) 37 d) 50

22)



Yukarıdaki koordinat düzlemimde hangi noktanın koordinatları (2, -4)'tür.

a) P b) Q c) R d)

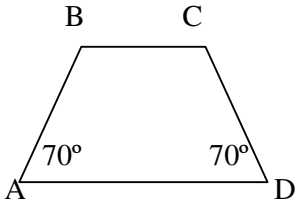
23) Bir raly'de iki kontrol noktasının arası 160 km'dir. Sürücüler bir kontrol noktasından diğerine maksimum puanı alabilmek için tam olarak 2,5 saatte gitmek zorundadır.

A) 160 km yi bu sürede gitmek için ortalama hız ne olmalıdır?
Cevap: _____

B) Bir sürücü 40 km'lik dağlık bölümü 1 saatte pistin başlangıcında gidiyor.
Eğer kontrol noktaları arasındaki toplam süre 2,5 saat ise kalan 120 km için saatteki ortalama hızı ne olmalıdır?

Cevap: _____

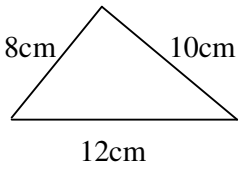
24) ABCD bir beşgendir.



Başka bir GHIJ yamuğu ABCD yamuğu ile benzerdir. G açısı ile J açısı ölçüleri 70º'dir. Bunlardan hangisi doğru olabilir.

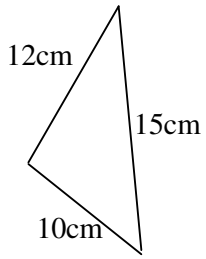
a)GH = AB
b)H açısı sağ açıdır.
c)GHIJ'nin bütün kenarları aynı uzunluktadır.
d)GHIJ'nin çevresi ABCD'nin üç katıdır.
e)GHIJ'nin alanı ABCD'nin alanından daha azdır.

25)

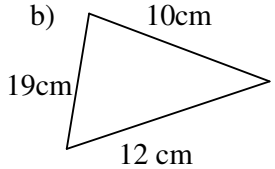


Aşağıdaki üçgenlerin hangisi yukarıdaki üçgenle benzerdir?

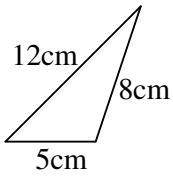
a)



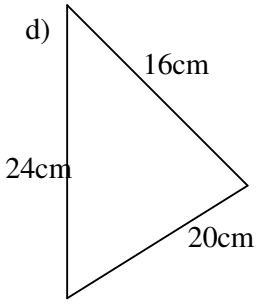
b)



c)



d)



APENDIX G

ANSWER KEY OF TEST A

1) a

2)

Correct response
55
Incorrect response
27 and 46 [23+4 and 37+9]
Either 27 OR 46
Other incorrect (including crossed out/erased, stray marks, illegible or off task)
Nonresponse
Blank

3) a

4)

Correct response
7x+4y= 43 (or equivalent) and 11x+12y=79 (or equivalent)
Incorrect response
No equation correct and one incorrect/missing
Other incorrect (including crossed out/erased, stray marks, illegible or off task)
Nonresponse
Blank

5) d

6) e

7) b

8) d

9) c

10) c

11) b

12) e

13) a

14) a

15)

Correct response
48% with calculation shown
Partical response
24 girls
Correct method but computational error
48% with no calculation shown
Incorrect response
%50
Other incorrect (including crossed out/erased, stray marks, illegible or off task)
Nonresponse
Blank

16) d

17) b

18) a

19)

Correct response
64 kph or 64 (or equivalent)
Incorrect response
Incorrect (including crossed out/erased, stray marks, illegible or off task)
Nonresponse
Blank

Correct response
80 kph or 80 (or equivalent)
Incorrect response
120 ——— or 48 shown 2.5
Other incorrect (including crossed out/erased, stray marks, illegible or off task)
Nonresponse
Blank

20) d

21)

Correct response
Plan B with explanation that includes three minutes used and explicit reference to lower monthly fee for plan B
Partial response
Plan B with explicit reference to lower monthly fee and no reference for three minute
Incorrect response
Plan B with inadequate (only three minute) or no explanation
Plan A with or without explanation
Incorrect (including crossed out/erased, stray marks, illegible or off task)
Nonresponse
Blank

Correct response
Plan A=140 zeds and Plan B=375 zeds, with works shown
Partial response
140 zeds and 375 zeds with no work shown
Plan A or plan B correct with work shown but no both
Incorrect response
Incorrect (including crossed out/erased, stray marks, illegible or off task)
Nonresponse
Blank
Correct response
150 with work shown
Partial response
150 with no work shown
Correct method but with no calculation error
Incorrect response
Incorrect (including crossed out/erased, stray marks, illegible or off task)
Nonresponse
Blank

22) b

23) b

24) c

25)

Correct response
60 degrees
Incorrect response
120 degrees
Incorrect (including crossed out/erased, stray marks, illegible or off task)
Nonresponse
Blank

APENDIX H

ANSWER KEY OF TEST B

1) c

2) e

3) b

4)

Correct response
18 AND 32
Incorrect response
18 and any number other than 32
18 and no numerical response for the 4th figure
Other incorrect (including crossed out/erased, stray marks, illegible or off task)
Nonresponse
Blank

Correct response	
98	
Incorrect response	
49	[Multiplies 7x7]
58	[Series is 2,8,18,28,38…7th term is 58]
Other incorrect (including crossed out/erased, stray marks, illegible or off task)	
Nonresponse	
Blank	

Correct response
Correct general (i.e., literal) expression, e.g., $2n^2$, or equivalent expressed in words
$2x50^2$ OR 2x50x50 OR 100x 50 OR (50+50)x50 OR equivalent expressed in words(disregard errors in computation)
Partial response
Derives answer (5000) without showing work
Other partial correct
Incorrect response
50x2 OR 100
50x50 OR 2500

Other incorrect (including crossed out/erased, stray marks, illegible or off task)
Nonresponse
Blank

5) b

6) e

7) d

8) b

9) b

10) d

11) a

12) a

13) c

14)

Correct response
48% with calculation shown
Partical response
24 girls
Correct method but computational error
48% with no calculation shown
Incorrect response
%50
Other incorrect (including crossed out/erased, stray marks, illegible or off task)
Nonresponse
Blank

15) d

16) a

17) c

18) c

19) b

20)

Correct response
7:25
Other response equivalent to 7:25
Incorrect response
7:20
7:30
6:25
Other incorrect (including crossed out/erased, stray marks, illegible or off task)
Nonresponse
Blank

21)

Correct response
Plan B with explanation that includes three minutes used and explicit reference to lower monthly fee for plan B
Partial response
Plan B with explicit reference to lower monthly fee and no reference for three minute
Incorrect response
Plan B with inadequate (only three minute) or no explanation
Plan A with or without explanation
Incorrect (including crossed out/erased, stray marks, illegible or off task)
Nonresponse
Blank

Correct response
Plan A=140 zeds and Plan B=375 zeds, with works shown
Partial response
140 zeds and 375 zeds with no work shown
Plan A or plan B correct with work shown but no both
Incorrect response
Incorrect (including crossed out/erased, stray marks, illegible or off task)
Nonresponse
Blank

Correct response
150 with work shown
Partial response
150 with no work shown
Correct method but with no calculation error
Incorrect response
Incorrect (including crossed out/erased, stray marks, illegible or off task)

Nonresponse
Blank

22)

Correct response	
60	
Incorrect response	
30 OR 50	[140^0 - 110^0 or 140^0 - 90^0]
55	[110/2]
Other incorrect (including crossed out/erased, stray marks, illegible or off task)	
Nonresponse	
Blank	

23)c

24)

Correct response
64 kph or 64 (or equivalent)
Incorrect response
Incorrect (including crossed out/erased, stray marks, illegible or off task)
Nonresponse
Blank

Correct response
80 kph or 80 (or equivalent)
Incorrect response
120 —— or 48 shown 2.5
Other incorrect (including crossed out/erased, stray marks, illegible or off task)
Nonresponse
Blank

25)b

APENDIX I

ANSWER KEY OF TEST C

1) a

2) b

3) a

4) a

5) a

6)

Correct response	
15	
Incorrect response	
25	[100 / 4]
60	[80/(4x5)]
71	[80-4-5]
Any expression or equation, other than x=15, containing x.	
Other incorrect (including crossed out/erased, stray marks, illegible or off task)	
Nonresponse	
Blank	

7) a

8) c

9) d

10)

Correct response
400 or equivalent
Incorrect response
Incorrect (including crossed out/erased, stray marks, illegible or off task)
Nonresponse
Blank

11) a

12)

Correct response	
30	
Incorrect response	
30 kg	[incorrect unit]
6/5	[6x1/5]
4	[4/5 more needed to comlete 1 kg]
5	[5 scoops = 1kg flour]
6	[from stem]
Other incorrect (including crossed out/erased, stray marks, illegible or off task)	
Nonresponse	
Blank	

13)d

14)

Correct response
A fraction with numerator smaller than 4 and denominator equal to 9, includes 3/9 = 1/3 OR 1/3
A fraction with numerator equal to 4 and denominator greater than 9, includes 4/10 = 2/5 OR 2/5
3/8
Other correct fraction
Incorrect response
5/9
2/3
Any fraction equivalent to 4/9
Other incorrect (including crossed out/erased, stray marks, illegible or off task)
Nonresponse
Blank

15)

Correct response
48% with calculation shown
Partical response
24 girls
Correct method but computational error
48% with no calculation shown
Incorrect response
%50
Other incorrect (including crossed out/erased, stray marks, illegible or off task)

Nonresponse
Blank

16) c

17) c

18)

Correct response
Plan B with explanation that includes three minutes used and explicit reference to lower monthly fee for plan B
Partial response
Plan B with explicit reference to lower monthly fee and no reference for three minute
Incorrect response
Plan B with inadequate (only three minute) or no explanation
Plan A with or without explanation
Incorrect (including crossed out/erased, stray marks, illegible or off task)
Nonresponse
Blank

Correct response
Plan A=140 zeds and Plan B=375 zeds, with works shown
Partial response
140 zeds and 375 zeds with no work shown
Plan A or plan B correct with work shown but no both
Incorrect response
Incorrect (including crossed out/erased, stray marks, illegible or off task)
Nonresponse
Blank

Correct response
150 with work shown
Partial response
150 with no work shown
Correct method but with no calculation error
Incorrect response
Incorrect (including crossed out/erased, stray marks, illegible or off task)
Nonresponse
Blank

19) b

20) d

21) a

22) c

23)

Correct response
64 kph or 64 (or equivalent)
Incorrect response
Incorrect (including crossed out/erased, stray marks, illegible or off task)
Nonresponse
Blank

Correct response
80 kph or 80 (or equivalent)
Incorrect response
120 —— or 48 shown 2.5
Other incorrect (including crossed out/erased, stray marks, illegible or off task)
Nonresponse
Blank

24) a

25) d

APPENDIX J

ITEM ANALYSIS OF BOOKLET A QUESTIONS

	Mean	SD	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
M1	0,4867	0,5015	10,9467	25,5676	0,5899	0,8053
M2	0,4067	0,4929	11,0267	26,3751	0,4332	0,8120
M3	,06733	0,4706	10,7600	26,1299	0,5113	0,8091
M4A	0,1867	0,3909	11,2467	27,2475	0,3456	0,8157
M4B	0,1600	0,3678	11,2733	27,4617	0,3149	0,8168
M5	0,4467	0,4988	10,9867	27,5837	0,1867	0,8220
M6	0,7000	0,4598	10,7333	26,4787	0,4482	0,8116
M7	0,7200	0,4505	10,7133	26,5817	0,4362	0,8122
M8	0,6267	0,4853	10,8067	26,3718	0,4421	0,8117
M9	0,5867	0,4941	10,8467	26,1173	0,4851	0,8099
M10	0,6067	0,4901	10,8267	26,7349	0,3622	0,8149
M11	0,4533	0,4995	10,9800	26,5969	0,3813	0,8141
M12	0,5867	0,4941	10,8467	25,5401	0,6061	0,8048
M13	0,2200	0,4156	11,2133	27,3099	0,3058	0,8170
M14	0,5800	0,5708	10,8533	26,1528	0,3995	0,8134
M15	0,2467	0,5173	11,1867	25,7770	0,5266	0,8078
M16	0,7800	0,4156	10,6533	27,6240	0,2321	0,8194
M17	0,3667	0,4835	11,0667	27,5526	0,2019	0,8212
M18	0,2533	0,4364	11,1800	27,8801	0,1607	0,8221
M19A	0,2000	0,4013	11,2333	26,9720	0,4025	0,8138
M19B	0,0800	0,2722	11,3533	28,5522	0,0635	0,8229
M20	0,2267	0,4201	11,2067	27,8026	0,1878	0,8210
M21A	0,1667	0,5235	11,2667	28,8009	-0,0470	0,8319
M21B	0,0067	0,0816	11,4267	28,8100	-0,0065	0,8223
M21C	0,0067	0,0816	11,4267	28,7429	0,0701	0,8218
M21D	0,0067	0,0816	11,4267	28,7161	0,1008	0,8216
M22	0,4667	0,5006	10,9667	26,7573	0,3482	0,8155
M23	0,4933	0,5016	10,9400	27,0232	0,2945	0,8177
M24	0,3133	0,4654	11,1200	26,8714	0,3571	0,8151
M25	0,3667	0,4835	11,0667	26,6130	0,3937	0,8136

APPENDIX K

ITEM ANALYSIS OF BOOKLET B QUESTIONS

	Mean	SD	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
M1	0,4444	0,4986	11,9653	44,6911	0,3298	0,8828
M2	0,5625	0,4978	11,8472	44,0884	0,4239	0,8808
M3	0,6667	0,5155	11,7431	44,0384	0,4143	0,8811
M4A	0,5903	0,4935	11,8194	44,6525	0,3400	0,8826
M4B	0,3542	0,4799	12,0556	44,1647	0,4301	0,8807
M4C	0,2153	0,4124	12,1944	43,9619	0,5497	0,8785
M4D	0,2014	0,5098	12,2083	44,1381	0,4046	0,8813
M5	0,7500	0,4345	11,6597	44,3659	0,4464	0,8804
M6	0,6597	0,4755	11,7500	44,2448	0,4218	0,8808
M7	0,5139	0,5016	11,8958	44,0940	0,4193	0,8809
M8	0,6458	0,4799	11,7639	43,7760	0,4932	0,8793
M9	0,6111	0,4892	11,7986	11,7986	0,5215	0,8787
M10	0,4167	0,4947	11,9931	43,6573	0,4951	0,8792
M11	0,2431	0,4304	12,1667	45,7343	0,2094	0,8848
M12	0,2778	0,4495	12,1319	44,2972	0,4412	0,8804
M13	0,5139	0,5016	11,8958	43,5905	0,4978	0,8792
M14	0,1806	0,4527	12,2292	43,9821	0,4916	0,8794
M15	0,8264	0,3801	11,5833	45,6853	0,2547	0,8837
M16	0,2639	0,4423	12,1458	45,7478	0,1998	0,8851
M17	0,3681	0,4840	12,0417	44,3759	0,3922	0,8815
M18	0,5833	0,4947	11,8264	44,7738	0,3202	0,8830
M20	0,3194	0,4679	12,0903	43,9568	0,4776	0,8797
M21A	0,2153	0,5692	12,1944	45,3605	0,1897	0,8868
M21B	0,0139	0,1174	12,3958	46,5765	0,3421	0,8837
M21C	0,0139	0,1174	12,3958	46,5765	0,3421	0,8837
M21D	0,0208	0,1433	12,3889	46,6309	0,2489	0,8840
M22	0,1875	0,3917	12,2222	43,9503	0,5844	0,8781
M23	0,2431	0,4304	12,1667	46,8951	0,0099	0,8884
M24A	0,1875	0,3917	12,2222	44,0761	0,5594	0,8786
M24B	0,0764	0,2665	12,3333	45,5524	0,4211	0,8816
M25	,3056	0,4623	12,1042	44,3457	0,4189	0,8809

APPENDIX L

ITEM ANALYSIS OF BOOKLET C QUESTIONS

	Mean	SD	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Alpha if Item Deleted
M1	,5758	,4961	13,2348	36,1505	,4175	,8715
M2	,6364	,4829	13,1742	36,2519	,4132	,8716
M3	,6364	,4829	13,1742	35,6870	,5143	,8690
M4A	,6894	,4645	13,1212	35,6951	,5363	,8685
M5	,4394	,4982	13,3712	36,0825	,4272	,8713
M6	,5076	,5018	13,3030	35,1441	,5868	,8670
M7	,6591	,4758	13,1515	35,6715	,5260	,8687
M8	,5682	,4972	13,2424	35,1469	,5926	,8668
M9	,6212	,4869	13,1894	36,3226	,3966	,8720
M10	,4773	,5014	13,3333	36,0560	,4285	,8712
M11	,7652	,4255	13,0455	36,1964	,4902	,8699
M12	,3030	,4613	13,5076	35,9465	,4932	,8696
M13	,6894	,4645	13,1212	36,0615	,4679	,8702
M14	,6364	,4829	13,1742	37,1679	,2525	,8757
M15	,2348	,4763	13,5758	35,8034	,5013	,8694
M16	,4318	,4972	13,3788	37,0615	,2608	,8756
M17	,8712	,3362	12,9394	38,0574	,1729	,8762
M18A	,3030	,6983	13,5076	36,0686	,2779	,8781
M18B	,0076	,0870	13,8030	38,8159	,0591	,8765
M18C	,0076	,0870	13,8030	38,8159	,0591	,8765
M18D	0152	,1226	13,7955	38,6983	,1142	,8762
M19	,4773	,5014	13,3333	35,5980	,5078	,8691
M20	,8106	,3933	13,0000	37,4809	,2600	,8749
M21	,2955	,4580	13,5152	36,1906	,4514	,8707
M22	,1515	,3599	13,1212	36,1379	,4537	,8706
M23A	,6894	,4645	13,4621	35,3955	,5734	,8675
M23B	,3485	,4783	13,6591	36,6692	,4792	,8706
M24	,3939	,4905	13,4167	36,3212	,3934	,8721
M25	,5682	,4972	13,2424	35,2843	,5681	,8675