CONTRIBUTIONS OF SELF-CONFIDENCE, ACTUAL WORK EFFORT AND PERCEIVED IMPORTANCE OF WORK EFFORT TO EIGHT GRADE STUDENTS' MATHEMATICS ACHIEVEMENT

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ABSTRACT

CONTRIBUTIONS OF SELF-CONFIDENCE, ACTUAL WORK EFFORT AND PERCEIVED IMPORTANCE OF WORK EFFORT TO EIGHT GRADE STUDENTS' MATHEMATİCS ACHİEVEMENT

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The purpose of the study was to predict mathematics achievement with self-confidence in mathematics, actual work effort in mathematics, and perceived importance of work effort in mathematics, and to investigate the gender differences with respect to those variables.

The study was conducted in Ankara, Turkey with 157 eight-grade students (87 boys, 70 girls) from a private school. The following measuring instruments were used:

(1) Confidence in Learning Mathematics Scale, (2) Effort as a Mediator of Mathematical Ability Scale, (3) Homeworks and Mathematics

Achievement Tests. The validity and reliability of the measuring instruments were tested by the researcher.

The data of this study were analyzed by using Stepwise Multiple Regression Analysis and Multivariate Analysis of Variance (MANOVA). The results of the study indicated that (1) the combined effect of three predictor variables (Self-confidence, actual work effort, and perceived Importance of work effort) on students' mathematics achievement was significant *($R^2_{adj}=0.543$).* Girls' mathematics achievement was significantly *($R^2_{adj}=0.531$)* affected by three predictor variables (Self-confidence, actual work effort, and perceived importance of work effort). Whereas for boys, two variables (Self-confidence and actual work effort) were the predictors which had a significant combined effect on mathematics achievement *($R^2_{adj}=0.539$)*. (2) There was no statistically significant mean difference between girls and boys with respect to self-confidence, actual work effort, perceived importance of work effort and mathematics achievement.

Keywords: self confidence, perceived importance of effort, actual work effort, gender, mathematics achievement

ÖZ

KENDİNE GÜVEN, ÇABA VE ÇABANIN ÖNEMİNİN ALGISNIN SEKİZİNCİ SINIF ÖĞRENCİLERİNİN MATEMATİK BAŞARISINA KATKISI

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Bu çalışmanın amacı matematik başarısının matematikte kendine güven, matematikte çaba ve matematikte çabanın öneminin algısı ile tahmin edilmesi ve bu değişkenlere göre kızlar ve erkekler arasındaki farklılıkları araştırmaktır.

Bu çalışma Türkiyede, Ankara'daki özel bir okulun 157 (87 erkek, 70 kız) 8. sınıf öğrencisiyle yapılmıştır. Aşağıdaki ölçme araçları kullanılmıştır. (1) Matematik Öğrenmede Kendine Güven Ölçeği, (2) Çabanın Matematik Yeteneğini Gösterme Ölçeği, (3) Ödevler ve Matematik Başarı Testi. Ölçme araçlarının geçerlik ve güvenilirlik çalışmaları araştırmacı tarafından yapılmıştır.

Bu çalışmanın verileri Lineer Sıralı Regresyon ve Çoklu Varyans Analizi metotları kullanılmıştır. Çalışmanın sonuçları şunları göstermiştir: (1) Kendine güven, çaba, ve çabanın öneminin algısı olmak üzere üç değişkenin öğrencilerin matematik başarısına toplu etkisinin anlamlı olduğu bulunmuştur *($R^2_{adj}=0.543$)*. Kızların matematik başarısını etkileyen, kendine güven, çaba, ve çabanın öneminin algısı olmak üzere üç değişken saptanırken *($R^2_{adj}=0.531$)*; erkeklerin matematik başarısını etkileyen iki değişkenin kendine güven ve çaba olduğu saptanmıştır *($R^2_{adj}=0.539$*. (2) Kızlar ve erkekler arasında kendine güven, çaba, çabanın öneminin algısı ve matematik başarısı değişkenlerine göre anlamlı bir ortalama farkına rastlanmamıştır.

Anahtar Kelimeler: Kendine Güven, Çabanın Öneminin Algısı, Ödev, Cinsiyet, Matematik Başarısı

To My Parents
For their love and support

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TABLE OF CONTENTS

ABSTRACT iv
ÖZ vi
ACKNOWLEDGEMENTS ix
LIST OF TABLES xii
LIST OF FIGURES xiv
LIST OF ABBREVIATIONS xvv
CHAPTERS
1.INTRODUCTION 1
1.1 Introduction 1
1.2. Significance of the Study 8
1.3. Statement of the Purpose 9
2.REVIEW OF THE LITERATURE 10
2.1 Confidence in Learning Mathematics 10
2.2. Perceived Importance of Work Effort 13
2.3. Actual Work Effort 20
2.4. Gender Differences 24
2.5. Summary 30
3.METHOD OF THE STUDY 31
3.1 Reserch Design of the Study 31
3.2 Main- and Sub-problems of the Study 32
3.3 Definition of Terms 33
3.4 Variables 34
3.5 Subjects of the Study 35
3.6 Measuring Instruments 35

3.6.1 Confidence in Learning Mathematics Scale 35
3.6.2 Effort as a Mediator of Mathematical Ability Scale..... 36
3.6.3 Mathematics Achievement Tests..... 37
3.6.4 Homework Grade 38
3.7 Prodecure 39
3.8 Analysis of Data..... 40
3.9 Limitations of the Study 41
3.10 Assumptions of the Study 42

4.RESULTS OF THE STUDY 43
4.1 Descriptive Statistics..... 43
4.2 Inferential Statistics 44
4.2.1 Results of Testing of First Problem 45
4.2.1.1 Results of Testing of the Hypothesis of the First Sub-Problem..... 45
4.2.1.2 Results of the Hypothesis of the Second Sub-Problem..... 52
4.2.1.3 Results of the Hypothesis of the Third Sub-Problem..... 58
4.2.2 Results of Testing of Second Problem 64

5.DISCUSSION, IMPLICATIONS AND RECOMMENDATIONS..... 68
5.1 Discussion..... 68
5.1.1 Discussion of the Results Regression Analysis..... 69
5.1.2 Discussion on the Results of MANOVA..... 71
5.2 Internal and External Validity..... 72
5.2.1 Internal Validity of the Study 73
5.2.2 External Validity of the Study 74
5.3 Implications 74
5.4 Recommendations for Further Research..... 75
REFERENCE..... 76
APPENDICES
A 84
B 86

LIST OF TABLES

TABLE

4.1 Means and Standard Deviations of Measures of the Study as Function of All Students and Gender…….…….....44

4.2 Intercorrelations among Measures for All Students ……...…….46

4.3 Linear Stepwise Regression Analysis Results for Combined Effect of Three Significant Predictor Variables on All Students' Mathematics Achievement…...49

4.4 Linear Stepwise Regression Analysis of All Students' Mathematics Achievement on Self-Confidence, Actual Work Effort, and Perceived Importance of Work Effort……50

4.5 Linear Stepwise Regression Analysis Results for Individual Effects of Three Significant Predictor Variables on All Students' Mathematics Achievement……51

4.6 Pearson Product Moment Correlations among Measures for Girls……..53

4.7 Linear Stepwise Regression Analysis Results for Combined Effect of Three Significant Predictor Variables on Girls' Mathematics Achievement……55

4.8 Linear Stepwise Regression Analysis Results for Individual Effects of Three Significant Predictor Variables on Girls' Mathematics Achievement……..56

4.9 Linear Stepwise Regression Analysis of Girls' Mathematics Achievement on Self-Confidence, Perceived Importance of Work Effort and Actual Work Effort……...57

4.10 Pearson Product Moment Correlations among Measures for Boys……59

4.11 Linear Stepwise Regression Analysis Results for Combined Effect of Two Significant Predictor Variables on Boys' Mathematics Achievement……....61

4.12 Linear Stepwise Regression Analysis Results for Individual effects of Three Significant Predictor Variables on Boys' Mathematics Achievement……...……62

4.13 Linear Stepwise Regression Analysis of Boys' Mathematics Achievement on Self-Confidence, Perceived Importance of Work Effort and Actual Work Effort……..63

4.14 Levene's Test of Equality of Error Variances……65

4.15 The Results of Univariate ANOVA for self-confidence, actual work effort, and perceived importance of work effort…… 66

LIST OF FIGURES

FIGURE

2.1 Kulm's Model "Relationship Between Attitudes and Behaviour ….…….15

4.1 Normal cumulative probability plot of observed versus predicted standardized residuals for predictors of mathematics achievement…..…….……47

4.2 Residual plot (Y' vs. Y-Y') for predictors of mathematics achievement.…..48

4.3 Normal cumulative probability plot of observed versus predicted standardized residuals for predictors of girls' mathematics achievement…….……54

4.4 Residual plot (Y' vs. Y-Y') for predictors of girls' mathematics achievement…….54

4.5 Normal cumulative probability plot of observed versus predicted standardized residuals for predictors of boys' mathematics achievement……...60

4.6 Residual plot (Y' vs. Y-Y') for predictors of boys' mathematics achievement……..60

LIST OF ABBREVIATIONS

Conf: Confidence in learning mathematics

Ach: Achievement in mathematics

Awe: Actual work effort

Piwe: Perceived importance work effort

CHAPTER 1

INTRODUCTION

Lack of mathematical knowledge prohibits many from participating in careers that would be economically rewarding as well as psychologically satisfying (Fennema & Sherman, 1977). Everyone uses mathematics daily. Therefore students must learn basic mathematics skills and concepts. Limited math proficiency will lead to limited success with the daily challenges of our society. For this reason more attention must be given, to have students understand the importance of mathematics and its connection and applications to have workplace and demands of daily life.

Many students traditionally struggle when first introduced to algebraic concepts in algebra course, because transition from concrete to abstract thinking is difficult. According to Juraschеck (1983), ‘‘the typical middle school class most likely contains a few students who are concrete operational, with the majority being in some transitional phase between the two stages (concrete operational and

formal operational)'' p.8. Some students are more ready to comprehend the use of letters to represent numbers, as well as to understand the process involved in algebraic problems. Others, however, encounter difficulties, not only with the concept of a variable, but also with logical thinking. Aiken (1970) stated that the correlations between attitude toward mathematics and achievement in elementary school, though statistically significant in certain instances, are typically very large. Later, Aiken (1976) noted that the attitude toward mathematics and Achievement in mathematics relationship is usually positive and meaningful at the elementary and secondary school levels. Thus, it is in the elementary school mathematics classroom that strong foundations can be developed, self-confidence can be raised, attitudes toward academic endeavors can improve, and proper work ethics can be established by students.

There have been numerous research studies involving the complex, interacting factors which may be used to predict academic achievement in mathematics. The idea of self-confidence has probably received the most attention. Kloosterman (1988) stated that "self confidence has been the key affective variable in the study of mathematics over the past 10 years" (p.347). Confident students tend to learn more, feel better about them, and are more interested in pursuing mathematical ideas than students who lack of confidence (Reyes, 1984). Confidence in learning mathematics has been also shown to be an important variable in predicting achievement (Ma & Kirshor 1997) and in affecting mathematics course-taking plans (Kloosterman, 1988). Students who are confident of their ability to learn mathematics are more likely to enroll in mathematics courses when enrollment becomes optional. One study showed that 64% of

students take more courses than required to graduate indicating that students are motivated to take courses by factors other than graduation requirements (Kloosterman 1988).

Self confidence in learning mathematics refer, how sure a person is of being able to learn new topics in mathematics, perform well in mathematics class, and do well in mathematics tests are used (Fennema & Peterson, 1983; Reyes, 1984). Students who are sure of their ability in mathematics will probably choose tasks involving mathematics more often end persist longer than those who are not sure they will succeed. Fennema and Sherman (1977 & 1978) studied the relationship between confidence in mathematics and mathematics achievement for students grades in 6-12. They found that positive relationship between mathematics achievement and confidence as measured by the Fennema Sherman Confidence Scale. Research studies on confidence in learning mathematics indicate the importance of this variable in relation to student achievement.

Moreover Kloosterman (1988) stated that, inclusion of this affective variable in the study may clarify its relationship with achievement in mathematics. Moreover Kloosterman (1988) concludes that self-confidence "has a stronger correlation with achievement than do other affective variables" (p. 345). The National Council Teachers of Mathematics (NCTM 1989), in the Curriculum and Evaluation Standards for School Mathematics have set new goals for students that address affective issues (NCTM, 1989). There is a common theme that emphasizes the students' self-confidence in their ability to both learning and does mathematics. These positive attitudes need to be fostered in the classroom.

In addition, Dodd (1992) states that ‘’lack of confidence in oneself is perhaps the greatest obstacle to learning because beliefs govern action. The belief that they can’t do something may render students unable to perform a task of which they were truly capable’’ (p.296). Although confidence in mathematics can be developed from cumulative past performances, the grade 6-8 is critical toward fostering a high level of self-confidence in students, since the level of mathematics taught is more abstract than earlier years, and many students falter when transitioning from the numbers to variables.

Confidence, which has generally been accepted as a belief about one's competence in mathematics, has been identified as one of the most important affective variables, influencing the students' approach to new material including a determining factor of their persistence (Reyes, 1984). The student will persist if confident of finding a solution or eventually gaining understanding; likewise, a confident student is more likely to participate in mathematical courses at a higher level.

Moreover Ercikan, Kadriye, McCreith, Tanya, Lapointe and Vanessa, (2005), stated that confidence in mathematics, a self-concept related variable, was the strongest predictor of mathematics achievement for females and for males in all three countries, except for American females. The strongest predictor for American females was parents' highest level of education attained (although confidence in mathematics placed the second). Research studies on confidence in learning mathematics indicate the importance of this variable in relation to student achievement. Thus, inclusion of this affective variable in the study may clarify its predictor for mathematics achievement.

Besides confidence in learning mathematics, attribution is a helpful means of examining the details of student motivation and achievement in schools. Mathematics education studies on concerning attribution deal with students' and teachers' perceptions of the causes of student success or failure on mathematics tasks. They have been done mainly to help and understand students' achievement in mathematics. Studies of attribution have examined how perceived causes of success and failure are related to academic achievement (Reyes, 1984).

There is a well established relationship between attribution and achievement related behaviors such as persistence, effort and choice of challenging tasks. When a person perceives the cause of success and failure as stable (ability or task difficulty); the change in expectations will be greater than when unstable factors (effort or luck) are seen as the cause (Weiner, 1974). According to Weiner (1974) when success is attributed to good luck, the increase in expectancy for future success in that situation will be smaller than if the success had been attributed to ability or ease of the task. Similarly, when failure is seen as caused by low ability, the drop in expectancy for future performance is greater than when failure is attributed to lack of effort or bad luck. So, including attribution as variable in the study may further our understanding of why certain students succeed or fail in mathematics. Identifying role of attribution in mathematics achievement may help teachers to develop ways to reduce attribution that produce learned helpless. Furthermore, McLeod (1992) stated that students' attributions on the relationship of effort to achievement and student confidence levels in performing mathematical tasks are two areas from the affective domain that may be useful in predicting mathematics achievement. In the classroom, it is difficult to

separate beliefs, attitudes, and emotions, since they interact with each other and with other factors in complex and varying ways. Students who believe that they can exert control over their learning in mathematics are more likely to engage successfully with a task, to redirect their efforts when they meet with hindrances and to learn more effectively. These students will achieve more cognitive success and in turn this reinforces their beliefs about school performance being controllable by themselves.

However, William (1997) said that

> "many successful students who have good attitudes exert more effort during the learning process. The amount of work effort expended seems to be particularly important in learning mathematics, since a certain amount of practice is often necessary to reinforce concept development. Actual homework completion rates, based on a percentage of the assigned mathematics problems that were completely by students over a period of time, might give a better understanding of how work effort correlates with mathematics achievement" p.3.

On the other hand, a gender difference in mathematics achievement is another area, which has become a repeatedly investigated one William (1997). Gender differences in mathematics achievement have received research emphasis over the past 30 years, especially in the areas of self-confidence and perceived importance of effort William (1997). There have been considerable efforts focusing on motivational explanations for gender differences in both achievements and choices related to mathematics. Meyer and Koehler (1990) have identified five components that impact upon gender differences and the learning of mathematics. These include confidence, the perception of the usefulness of mathematics, beliefs pertaining to the perception of mathematics as a male domain, the fear of success, and attribution style. An examination of these components and the ways in which

they interact may help in understanding the contribution that they might make to gender differences in mathematics achievement.

The research study conducted for this thesis should add the research base on these two constructs, as well as provide new data regarding the relationships among gender, actual work effort, and mathematics achievement.

1.2 Significance of the Study

Self-confidence is a variable that is important for all students (Kloosterman, 1988). In addition self-confidence has been shown to be a valid predictor of academic achievement. This has consistently been reported in mathematical achievement studies, as well as research in other fields (Fennema & Sherman, 1977; Reyes, 1984; Kloosterman, 1988; Sax, 1994). In many of the research studies investigated, the construct of self-confidence has been reported to be an important factor in differential mathematics course selections and career choices of students (Sherman, 1980; Perl, 1982; Eccles& Jacobs, 1986; Kloosterman, 1988; Hyde, Fennema, Ryan, Frost, & Hopp, 1990). The review of the literature consistently shows a relatively strong, positive relationship between self-confidence and mathematics achievement and also between self-confidence and other variables that contribute to mathematics achievement. If we find the same result with the literature, we can work for improve students self confidence, in Turkey.

In social psychology, perceived importance of effort is one construct of the wide field of attribution theory. Attribution theory basically deals with what a

person perceives as the cause of certain outcomes- why one achieved success or failed to achieve it (Weiner, 1979). Kulm (1980) developed a model to research mathematics attitudes and behaviors. Accordingly to Kulm (1980), if a student believes that effort is very important to success in mathematics and has been assigned a challenging homework assignment that is not too difficult to accomplish, whether the student Works hard on the assignment or gives up easily may depend on the student's level of self-confidence, a strong effort on the assignment is unlikely. One approach to research on attitudes, recommended by Kulm (1980), is to conduct correlational studies to investigate how existing attitudes and other variables relate to a certain behavior. The research study conducted for this thesis follows this approach by using attitudes and behaviors to examine relationships and to predict mathematics achievement.

Wolleat, Pedro, Becker, and Fennema (1980) suggested that future studies should answer the research question

> ''Do high-achieving females expend significantly greater effort, that is, do their attributions, assignment illustrated by this study, and reflect actual or perceived amounts of effort? On the basis of attribution theory, one would speculate that it is the latter. More specific information on this issue could add to our understanding of female students' attributional behaviors'' (p.365).

The research study conducted for this thesis involves the investigation of the interaction of variables representing perceived importance of effort and actual work effort. In addition, until today research studies have not investigated the correlation between the perceived importance of effort and actual work effort that can be quantitavely measured.

1.3 Statement of the Purpose

The purpose of this research study was to determine the relationships of self-confidence, actual work effort as measured by homework, and the perceived importance of work effort with mathematics achievement at the eight grade level. The study further investigated the interrelationships of these factors with gender on mathematics achievement

CHAPTER 2

REVIEW OF THE LITERATURE

In this chapter, the literature related to the present study is reviewed. Based on the content and the main objectives of the study, the literature is classified into four sections; studies on self confidence in learning mathematics, studies on perceived importance of effort, studies on actual work effort and studies on gender differences.

2.1 Self Confidence in Learning Mathematics

Confidence in learning mathematics refers to ones ability to learn and perform well on mathematical tasks (Fennema & Sherman, 1977). How sure a student in of his or her ability to learn new mathematics and to do well on mathematical tasks is one part of the self-concept? Confidence influences a student's willingness to approach new material and to persist when the material

becomes difficult (Reyes, 1984). In addition Reyes (1984) stated that the construct of self-concept has a consistent, positive relationship with general academic achievement, citing 11 studies in the 1970's to support these findings. The related construct of mathematics anxiety was evaluated for possible use in the research study conducted for this study, but self-confidence in learning mathematics was selected as an independent variable instead. Mathematics anxiety is somewhat difficult to define because it has varying effects for different people. For purposes of this study, mathematics displayed while solving complex mathematics problems, word problems, or extended problem-solving activities. Mathematics anxiety correlates negatively with mathematics performance and mathematics anxiety also seems to be more prevalent in girls than in boys (Eccles & Jacobs 1986). Since self-confidence and mathematics anxiety are nearly opposites (i.e., if students have high self-confidence, they usually have low mathematics anxiety), it would seem that a research study would need to investigate only one of these two constructs at a time (Fennema & Sherman, 1976). Furthermore, Kloosterman (1988) states that ‘‘because self-confidence is a variable that is important for all students, whereas math anxiety affects only a minority, self-confidence, rather than anxiety, has become the variable most investigated “. For this reason this study investigated self confidence, not mathematics anxiety.

Moreover self confidence has been reported to be an important factor in differential mathematics course selections and career choices of students (Eccles & Jacobs, 1986; Kloosterman, 1988; Hyde, Fennema, Ryan, Frost, & Hopp, 1990). In addition, Fennema and Sherman (1977) found positive significant correlations

between mathematics achievement and confidence as measured by Fennema-Sherman Confidence scale.

In addition self-confidence has been shown to be a valid predictor of academic achievement. This has consistently been reported in mathematical achievement studies, as well as research in other fields (Fennema & Sherman, 1977; Reyes, 1984; Kloosterman, 1988; Sax, 1994). These studies investigated, the construct of self-confidence was the strongest predictor of mathematics achievement among the entire variable studied.

Pedersen et. al. (1985) examined the relationship between nine different affective variables and achievement in mathematics amongst 1,937 seventh- and eighth-grade students from thirteen junior high schools in the United States. They found confidence to correlate higher with achievement than with any other affective variable ($r = 0.43$). However, Bulut (1988) didn't find statistically significant relationship between mathematics self-concept and mathematics achievement of mathematics prospective teachers.

Of particular importance to the current research study is the work of Kloosterman (1988) involving seventh-grade students, where he found a correlation of .39 between self-confidence in learning mathematics and effort as a mediator of mathematical ability. Kloosterman also found significant, positive correlations between self-confidence and other motivational variables (attributional style, failure as an acceptable phase in the learning of mathematics, thoughts about success, and thoughts about failure).

The review of the literature in the present study generally shows a relatively strong positive relationship between self-confidence and mathematics

achievement and also between self-confidence and other variables that contribute to mathematics achievement.

2.2 Perceived Importance of Effort

In social psychology, perceived importance of effort is one construct of the wide field of attribution theory. The way in which a student attributes causation for success and failure is another affective variable prominent in the literature. Mathematics education attribution research uses a formulation of attribution of academic success and failure developed by Weiner (1979). He proposes a two dimensional model with four major causes of success and failure-ability, effort, task difficulty, and luck, organized in 2x2 matrix (see Table 2.1).

Table 2.1

Attribution of Success and Failure from Wiener (1979), p.5.

Stability	Locus of control	
	Internal	External
Stable	Ability	Task Difficulty
Unstable	Effort	Luck

The two dimensions are locus of control and stability. Locus of control relates to whether the cause of success or failure is perceived to result from some factor within or outside of the individual; stability is concerned with whether the cause can change for an individual from one time to another. Since ability is the same frame one time to another and is due to a factor within a person, it is categorized as stable and internal. Effort is internal and unstable because the individual has control over effort and may vary the effort expended in different situations. Task difficulty is stable, because a given task doesn't change in difficulty from one situation to another. Task difficulty is also external since a person has no control over it. Luck changes from time to time and is dependent of the individual; therefore, it is classified as unstable and external.

Related to Weiner's model of attribution theory concerning the causes of success or failure is the categorization of students as learned-helpless and mastery-oriented (Dweck, 1986; Diener & Dweck, 1978). "Learned-helpless student attribute failure to stable factors, such as lack of ability. They also react to failure with solution irrelevant statements and derogatory comments. Such as "I am stupid" and "I never did have a good memory" (Diener & Dweck, 1978, p.458.)".

"In contrast, mastery-oriented students tend not to make failure attributions. Instead they acknowledge their errors but do not regard the as failures. They attribute the mistakes to unstable factors, such as bad luck, lack of efforts, and unfairness of the experimenter. They also engage in self instructional statements; for example, "I should slow down and try to figure this out" and "The harder I need to try" (Diener & Dweck, 1978)".

Kulm (1980, p.360.) presents a model for the relationship between attitudes and behavior, which is related to the research study conducted for this thesis. The model was developed as a source of hypotheses for research on attitudes toward mathematics (see Figure 2.1).

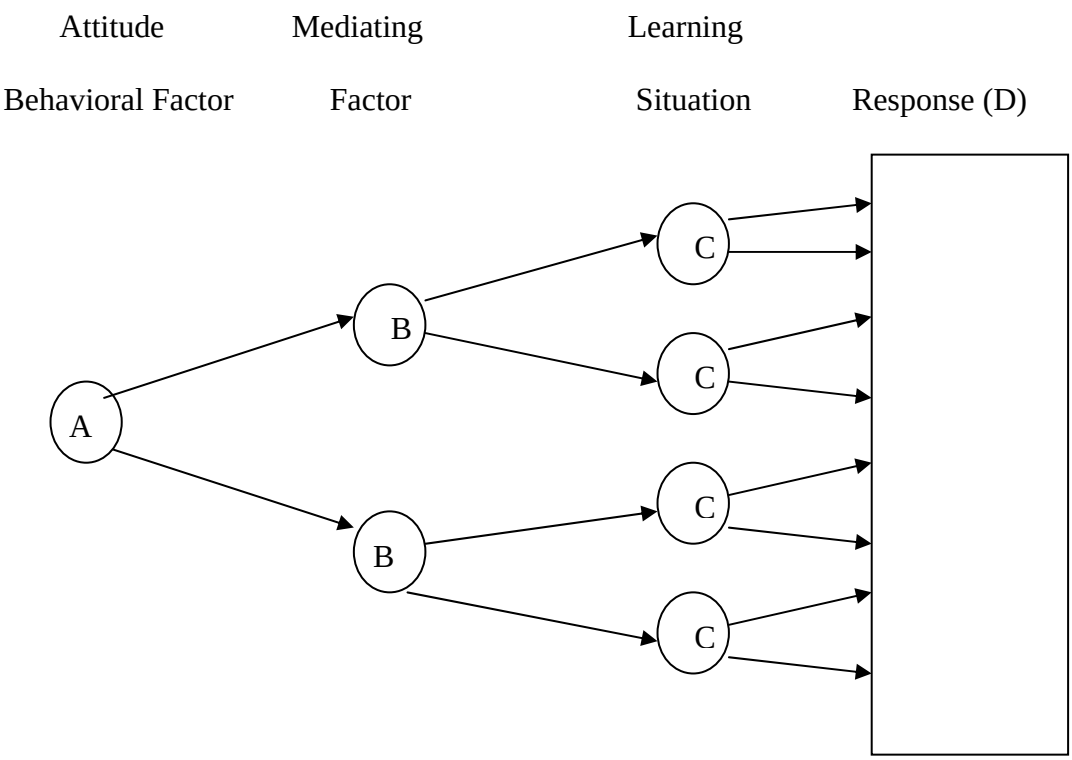


Figure 2.1 Kulm's Model "Relationship between Attitudes and Behavior"

In the model the attitude factor, represented by A, may be either positive or negative. An example of a positive attitude factor is "enjoy mathematics". B represents a mediating factor such as liking the mathematics teacher (a positive factor) or feeling that mathematics is an inappropriate area of study (a negative factor). The learning situation, C, is concerned with factors such as the difficulty of the learning task, the importance of the task, or the length of time needed to complete the learning task. The behavioral response might be spending time on task, being persistent in working on mathematics assignments, or completing difficult assignments. For example, if a student believes that effort is very

important to success in mathematics (attitude factor A), and has been assigned a challenging homework assignment that is not too difficult to accomplish (learning situation C), whether the student works hard on the assignment or gives up easily (behavior D) may depend on the student's level of self-confidence, (mediating factor B). If student has a high level confidence, a strong effort on the assignment may result. However, if student‘s self confidence low , a strong effort on the assignment is unlikely. One approach to research on attitudes, recommended by Kulm (1980), is to conduct correlational studies to investigate how existing attitudes and other variables relate to certain behavior. The research study conducted fort this thesis follows this approach by using attitudes and behaviors to examine relationships and to predict mathematics achievement.

Another theory of achievement motivation relevant to the research study conducted for this study deals with self-efficacy. Self- efficacy expectations are beliefs in one's ability to successfully accomplish a task for to implement a behavior in a specific circumstance.

> ‘‘Not only can perceived self-efficacy have directive influence on choice of activities and settings, but through expectations of eventual success, it can affect coping efforts once they are initiated. Efficacy expectations determine how much effort people will expend and how long they will persist in the face of obstacles and aversive experiences. The stronger the perceived self-efficacy, the more active the efforts’’ (Bandura, 1977. p.194).

In attribution theory, ‘‘the role of effort has received considerable attention, because unlike ability, task difficulty, or luck, effort presumably is under volitional control and amenable to change’’ (Schunk, 1984, p.49). Hackett and Betz (1989) investigated the relationship between mathematical performance and mathematics self efficacy, toward mathematics, and the choice of mathematics-related majors by 262 students. They found that mathematics performance was

correlated (correlation coefficient of .44) moderately with mathematics self efficacy. In addition they found that mathematics performance and mathematics self efficacy were significantly and positively correlated with attitudes toward mathematics. Also their regression analyses supported the superiority of mathematics self efficacy over mathematics self performance and achievement variables in predicting the choice the mathematics-related major.

Other research studies also found a strong, positive relationship between mathematics self-efficacy and mathematics performance (Multon, Brown, & Lent, 1991). Multon et al. (1991) found 68 published and unpublished papers written between 1977 and 1988 on the relationship between self-efficacy and academic performance and persistence. Of these, only 36 studies with 38 samples, encompassing 4,998 participants, assessed academic performance and met their criteria for inclusion in a meta-analysis, which were that the study contain a measure of self-efficacy and academic performance and provide sufficient information to calculate effect size estimates. They computed that efficacy beliefs were related to performance ($r = .38$) and accounted for approximately 14% of the variance in students' academic performance. Multon et al. (1991) discovered that the strongest effects were obtained by researchers who compared specific efficacy judgments with basic skills measures of performances, who developed highly concordant self-efficacy and performance indices, and who administered them at the same time.

Zimmerman, Bandura, and Martinez-Pons (1992) conducted a study to assess the direct and indirect effects of self-efficacy beliefs on high school students and self-regulated studying. The researchers constructed two scales related to self-

efficacy: self-efficacy for self-regulated learning (e.g., for using learning strategies' and self-efficacy for academic achievement (e.g., capability beliefs concerning math and science). The results indicated that self-efficacy for self-regulated learning was associated with self-efficacy for academic achievement and self-efficacy for academic achievement was predictive of students and grade goals and final grades. Self-efficacy for academic achievement was also indirectly predictive of the students' final grades through the goals they set for themselves.

These studies found the strongest relationship between mathematics self-efficacy and mathematics performance on specific skills and tasks, particularly when the self-efficacy attribution and the mathematics performance test were administered attitude the same time. Thus, self-efficacy appears to be a factor that relates to performance in mathematics. Whereas self-confidence in mathematics is a more global construct dealing with one's ability to learn mathematics concepts, ''self-efficacy theory calls for the assessment of confidence in performance expectations for specific tasks'' (Hackett & Betz,1989, p.264) . Since the research study conducted for this study focuses more on global performance in mathematics over a three-month period of time, not on specific mathematics tasks, self-confidence was chosen assignment an independent variable to investigate rather than self-efficacy, although the two concepts are closely related.

As discussed above, the concept of perceived importance of effort is common throughout the motivational theories of attribution, learned helpless and self-efficacy Most of the research on the perceived importance of effort deals with effort and ability attributions. McLeod (1992) states that in his summary of the research on effect in mathematics education ''males are most likely than females

to attribute their success in mathematics to ability and females are more likely than males to attribute their failures to lack of ability. In addition, females tend to attribute their successes to extra effort more than males do, and males tend to attribute their failures to lack of effort more than females do'' (p.580). The significance of this is that students who attribute their failures to lack of effort (more boys than girls) are likely to try harder on future tasks that are similar. However, students who attribute their failures to lack of ability (more girls than boys) are more likely to give up on mathematics tasks. Obviously, the motivational strategy that teachers would desire students is the former, not the latter.

A research study which compared ability and effort attributions for students from Japan and United States was conducted by Holloway (1988). The author found that Japanese students placed more emphasis on effort than their American counterparts did. However, in Japan, it is more than just a perception of the importance of work effort; effort is part of the Japanese culture, where hard work, persistence, and the intrinsic value of learning are valued highly. Japanese children seem not only to believe that effort is important, but they also actually work hard on academic endeavors in practice. In this study Actual Work Effort defined a measure of the degree to which students struggled to learn mathematical concepts. The research study conducted for this study involves the investigation of the interaction of variables representing perceived importance of effort and actual work effort.

2.3 Actual Work Effort

Most of the research on work effort deals with self-reports on the amount of time spent on homework (Holmes & Croll, 1989). Although most educators agree that homework has a positive effect on achievement, prior research studies have not effectively addressed this issue. Paschal, Weinstein, and Walberg (1984) provided a review of the research documented on a homework for the period 1960-1981, concluding that ‘‘homework appears to benefit learning, especially if graded and commented upon’’ (p.104). Furthermore, the authors stated that ‘‘much of the voluminous, 70 year-old literature on homework was opinionated and polemical, and surprisingly few methodologically adequate studies have been conducted’’ (p.104).

In addition Epstein and Pinkow (1988) updated this study by analyzing 26 United States and international studies from the period 1981-1986 and presented a conceptual model for guiding research on homework. The authors stated that ‘‘research has not been conducted that informs us well about how to accomplish the many instructional and motivational goals we set for homework. Indeed, for over three decades, research had hardly moved beyond measures of time – teachers’ reports of the amount of time their assignments take or students’ reports of the time they spend doing homework’’ (p.1). They also mentioned that ‘‘most studies still consider ‘hours’ of homework assigned by the teacher or spent by the student assignment the most important factor. Our review of recent literature shows that the issues are complex’’ (p.3). For one thing, hours may not be

indicative of actual effort expended, since able learners actually need less time than slower learners to master a mathematical concept, and thus higher performers would be given a lower score on a survey considering only time spent on homework.

Moreover Keith (1982), in one of the most –quoted studies in homework research in which he used the data derived from the National Education Longitudinal (NELS) study of 1982, measured the influence of homework on the achievement of 20, 364 high school students. In his study he noted that time spent on homework was shown to have a direct and positive impact on learning.

Paschal, Weinstein, and Walberg (1984) examined 15 studies of homework and academic achievement, and they found that: a) homework had positive impact on achievement; b) the effects of homework were greater in social studies than in other subject areas; c) frequent homework assignment had a greater effect that did intermittent homework; d' the effect of homework did not differ with socioeconomic status and e) homework completion had a greater effect on academic achievement than did socioeconomic status.

Alexander (2002), investigated how he could relate homework assignments that would compliment in-class work and increase math skills. He devised three homework assignments for middle school students. He concluded that some work activities should incorporate the same features as any good in-class activity. Homework assignments do not have to relate to a current lesson, but it is important to name the purpose for tasks assigned and those tasks need to be part of the broader goals of the math curriculum. Alexander advised teachers to design

homework assignments that vary in their purpose, challenge the students, and encourage a high degree of student interest.

In 1989, the most comprehensive and the most quoted meta-analysis of homework and its effects on achievement were a conducted by Cooper. In his study he analyzed nearly 120 empirical studies of homework and the ingredients of successful homework assignments. The study revealed that although a positive correlation between homework completion and achievement on tests did exist, the degree to which it exists depends on the grade level of the student. He found that students at the high school level saw a significant effect in their achievement as a result of homework completion, but as the grade level of the student lowered so did their achievement, regardless of the amount of homework completion. Specifically, for high school he found that those who complete homework might outscore those that do not by 69%; for middle school by 60%; and for fourth through sixth grades by 52%. However, of the few studies conducted on the effects of homework on achievement in the primary grades, kindergarten through third grade, the findings were unimportant.

In other study Cooper (2001, April) synthesized 120 studies of homework effects and determined a list of factors that report positive effects of homework: 1) Immediate achievement and learning, 2) Long-term academic benefits include improved study skills, positive attitudes, 3) Nonacademic benefits including self-discipline, initiative, organizational skills, and 4) Greater parental appreciation of and involvement in schooling. Negative effects of homework include: 1) Satiation, 2) Parental interference, 3) Cheating, and 4) Increased differences between students from low-income and affluent homes. High school students benefited

more than middle school students. He suggested possible reasons for the small effect of homework on elementary students could be developmental. He indicated that they have short attention spans, they have not developed study skills and they are easily distracted. His work focused on the student and the positive outcomes of doing homework. It generally supported homework.

The relationship between homework completion and test scores is indicated in the evidence showing a positive relation between the frequencies of completed homework assignments to mathematics achievement gains; lengthy homework assignments on the other hand, tended to be negatively related to achievement gains (Trautwein, Koller, & Schmitz, 2002).

A gap in the research to date appears to be measurement of actual work effort and how this correlates with achievement in mathematics. Even though homework completion is a topic in Epstein and Pinkow's (1988). Actual homework completion rates, based on a percentage of the assigned mathematics problems that were completed by students over a period of time, might give a better understanding of how work effort correlates with mathematics achievement. This quantities measure of work effort would be a different variable than either self-attributions regarding the perceived importance of work effort or self-reports (or even teacher-reports) of time spent on homework, and the results would add to the research base on mathematics achievement.

2.4 Gender Differences

A secondary focus of the current research study involved gender differences, which have received significant attention from educational researchers. In fact, 38 of the 355 articles published in the *Journal for Research in Mathematics Education* from 1978 to 1990 dealt with gender issues, and especially with gender differences in mathematics achievement (Leder, 1992).

Popular perspective on gender differences in mathematics achievement can be attributed to recent meta-analytic studies of the differences between males' and females' performances on standardized achievement tests in mathematics. The picture that has emerged from these studies is clear and consistent: in the general population gender differences on achievement tests in mathematics are small (Hedges & Nowell, 1995; Hyde, Fennema, & Lamon, 1990; Linn & Hyde, 1989).

Though gender differences on mathematics achievement test are unimportant for the general population reflecting fairly stable absolute effect sizes ranging from 0.02(favoring males) to 0.05 (favoring females) (Hyde, Fennema, & Lamon, 1990), They increase meaningful with age as a function of the cognitive level of the test. In elementary school (ages 5-10) there are no differences between boys and girls on tests of problem solving or understanding of mathematical concepts but a slight advantage favoring girls appears on tests of computation (0.20). The trend continues through the middle school years (ages 11-14), but reverses in high school (ages 15-18) where boys show a slight advantage on tests of mathematical concepts (0.07) and a relatively larger advantage on tests

of problem solving (0.29). The male advantage on tests of problem solving continues and increases in college (0.41; ages 19-25) and beyond (0.59; ages 26 and older) (Hyde, Fennema, & Lamon, 1990).

In addition to research studies identifying gender differences in mathematics achievement, extensive research has been performed over the past 30 years to help explain why these differences between males and females may have occurred. Several research articles describe the multitude of variables used to analyze gender differences (Tartre & Fennema, 1995). The construct receiving the most attention of educational researchers is confidence in learning mathematics, which shows males have more self confidence than females in mathematics.

Previous research on self- confidence in learning mathematics has found a significant difference in self-confidence between men and women (Betz & Hackett 1983; Matsui, Matsui & Ohnishi, 1990). Women have been characterized as having a low mathematical self-concept, i.e., they tend to underestimate their intellectual abilities and their lack of self-confidence often results in math anxiety (Sherman 1979).

One way of comparing the performance of men to that of women on a mathematics assessment is to compare the mean raw score of a random sample of women against the mean raw score of a random sample of men. Most studies of gender differences have used this approach. Hundreds of such studies have been summarized in several meta-analyses (Friedman, 1994; Frost, Hyde, & Fennema, 1994; Hyde, Fennema, & Lamon, 1990; Linn & Hyde, 1989). In the meta-analyses, the authors converted the mean difference in scores reported by each study to an effect size d (difference in mean scores divided by the pooled within-

group standard deviations). The average effect size was 0.31 in favor of boys for studies conducted before 1974, and 0.15 for studies conducted after 1974 (Frost et al., 1994). They also found that girls scored slightly better than boys during the elementary (average d = -0.06) and middle school (average d = -0.07) years, but men scored substantially better than women in the high school (average d = 0.29) and college years (average d = 0.41). Men often did better than women in certain content areas such as geometry and problem solving, whereas women usually did as well as men or better in algebra, arithmetic, and computation (Frost et al., 1994).

A large number of explanations have been put forward to account for gender differences in mathematics, varying from affective psychological factors (e.g., mathematics attitude) to social factors (e.g., parents' and teachers' encouragement). Affective factors play an important role in the learning and teaching of mathematics (McLeod, 1990). For example, such factors can have an important impact on students' decisions about how much mathematics they will need in the future and how they approach the mathematics content they study (Reyes, 1984). However, the meta-analyses by Frost et al. (1994) indicate that the magnitude of gender differences in mathematics achievement and mathematics-related attitudes and affect are small to moderate.

Self-confidence has also been widely researched from the aspect of gender differences (Reyes, 1984; Jones & Jones, 1989; Kimball, 1989). Studies reported on or summarized by these authors consistently show that boys in grades 6-12 have more self-confidence in learning mathematics than girls. Gender differences in self-confidence in learning mathematics have been linked to achievement in

mathematics in some studies (Fennema & Sherman, 1977; Eccles & Jacobs, 1986), but the meta-analysis conducted by Hyde, Fennema, Ryan, Frost, and Hopp (1990) found that the magnitude of the gender difference in mathematics self-confidence, for example, is about the same as the magnitude of the gender differences in mathematics performance, and both are small.

Mau and Lynn (2000), tested the statistical significance of the male – female differences tested by analysis of variance .They noted that boys obtain higher mean scores than girls on the tests of math and science, while girls obtain higher scores on reading than boys and do more homework.

Leahey and Guo (2001) find few gender differences among younger children's general math skill. Pooling the Peabody Individual Achievement Test (PIAT) math scores over all five National Longitudinal Survey of Youth (NLSY) testing years (1986, 1988, 1990, 1992, 1994), they examined mean scores by age and gender. There is little difference between boys' and girls' mean math scores. Girls actually have higher average math scores than boys until about age 11, when boys' mean surpasses girls' by half a point -- but this boys advantage is not statistically significant. In addition they find that the standard deviation for boys' scores is slightly higher than that for girls. Similarity in gender-group medians demonstrates that the difference in variances explains most of the difference in mean math scores.

Fennema and Carpenter (1981) found that on a notion wide basis, there was slight difference between girls and boys in overall mathematics achievement at ages 9 and 13, at age 17. However, girls were not achieving at the same level in mathematics, as were boys. Even when girls and boys enrolled in the same

mathematics courses boys' performance was higher than that of girls and differences were greatest on the more complex tasks.

Other areas of concern for educational researchers are differential course-taking in mathematics and differences in mathematics experiences for males and for females (Leder,1992). Pedro, Wolleat, Fennema and Becker (1984) studied on the identification of important variables that related to the election of mathematics courses for each gender enrolled in algebra and for each gender in geometry classes. Subjects of the study were 633 girls, 572 boy students enrolled in nine high schools. Of the total set of variables investigated in the study, they found that only a small subset of attitudes and attributions helpful in explaining the variation in high school mathematics plans when achievement controlled. Usefulness appeared to the variable having the strongest relationship with the mathematics plans of both genders.

In addition(Dweck, 1986) stated that girls tend to believe in an entity theory of intelligence, meaning that you either are intelligent or you are not. When difficult mathematics problems are encountered, girls who possess the gentility theory tend to put less effort toward solutions blaming failure on lack of ability. Boys, on the other hand, are more likely to believe in an incremental theory of intelligence and that their intelligence can be increased (and mathematics problems solved) by exerting more effort. Steinback and Gwizdala (1995), they pointed out that both the girls and the boys reported that the teacher considered the boys smarter and the boys themselves perceive that boys are smarter.

Societal differences for males and females have also been researched as a possible reason for gender differences in mathematics achievement. Gender

stereotypes and sex-role behavior have surfaced assignment possible factors that can affect mathematics achievement. These are related to the expectations and attitudes of both parents and teachers (Eccles & Jacobs, 1986). In the area of societal differences, classroom learning environment has also been investigated by educational researcher (Forgasz, 1995).

Another area of gender-differences is in attitudes toward mathematics as a male domain, mathematics anxiety, and several others. Differences have been found between male and female responses (Fennema & Sherman, 1976; Terwilliger & Titus, 1995; Forgasz, 1995; and Steinback & Gwizdala, 1995). These attitudinal differences between males and females are often interrelated with other variables mentioned in this study.

Gender differences in mathematics achievement are difficult to research, since there are so many diverse, interacting variables involved. Researchers continue to investigate self-confidence, mathematics-background, societal and learning environment factors, casual attributions, spatial visualization, and attitudes toward mathematics assignment variables that contribute to mathematics achievement.

Recognized the complexity of the gender issue in mathematics, the research study conducted for this study adds to the research base by investigating how gender relates to self-confidence in learning mathematics, perceived importance of effort, and actual work effort.

2.5 Summary

There is an abundance of research relevant to the current research study, and researchers continue to explore the complex, interacting factors which related to mathematics achievement. Three important aspects of the current research study (self-confidence in learning mathematics, perceived importance of effort, actual work effort, and gender differences) have a strong research base. The review of the research suggests that when self-confidence of student's increases, the amount of effort expended will also increase, and then mathematics achievement will increase, which will result in higher self-confidence and so forth. Recognizing the potential for using self-confidence, perceived importance of effort, gender, and actual work effort (including both individual and combined effect) to predict mathematics achievement, the research study conducted fort his study was designed to add to the existing research base.

CHAPTER 3

METHODS OF THE STUDY

In the previous chapter, the related literature was reviewed and the essence of the study was justified. In this chapter, research design, main and sub-problems, definition of terms, description of variables, subject of the study, development of measuring tools, procedure, methods used to analyze data, limitations and assumptions of the study are explained briefly.

3.1 Research Design of the Study

The purposes of the study were: (1) to predict mathematics achievement with self-confidence in mathematics, actual work effort in mathematics, and perceived importance of work effort in mathematics at elementary school level, and (2) to investigate the gender differences with respect to those variables. Therefore, the study was both a correlational and a causal-comparative study.

3.2 Main- and Sub-problems of the Study

The problems of the study are the following:

P1. How well can mathematics achievement be explained in terms of self-confidence, actual work effort, and perceived importance of work effort?

P1.1 To what extent could self-confidence, actual work effort, and perceived importance of work effort be accounted for *all students'* mathematics achievement?

P1.2 To what extent could self-confidence, actual work effort, and perceived importance of work effort be accounted for *girls'* mathematics achievement?

P1.3 To what extent could which self-confidence, actual work effort, and perceived importance of work effort be accounted for *boys'* mathematics achievement?

P2. Is there any mean difference between girls and boys with respect to mathematics achievement, self-confidence, actual work effort, and perceived importance of work effort?

In order to examine the sub-problems related the first problem, the following three null hypotheses are stated respectively. These hypotheses are tested at a significance level of 0.05.

The first problem is examined by the following hypotheses:

- **H1.1** The three variables together (self-confidence, actual work effort, and perceived importance of work effort) do not explain a significant amount of variance in all students' mathematics achievement.

- **H1.2** The three variables together (self-confidence, actual work effort, and perceived importance of work effort) do not explain a significant amount of variance in *girls'* mathematics achievement.

- **H1.3** The three variables together (self-confidence, actual work effort, and perceived importance of work effort) do not explain a significant amount of variance in *boys'* mathematics achievement.

The second problem is examined by the following hypothesis:

- **H2.** There is no significant mean difference between girls and boys with respect to mathematics achievement, self-confidence, actual work effort, and perceived importance of work effort.

3.3 Definition of Terms

Self-Confidence: It is a belief in oneself that gives inner strength to accomplish and overcome tasks which may require general self-confidence or confidence in certain areas, such as self-confidence in learning mathematics. In this study Self-

confidence refers to score obtained from Confidence in Learning Mathematics Scale developed by Fennema and Sherman (1976).

Mathematics Achievement: It is a measure of student's success in mathematics which for this study was measured by the average of the scores obtained from four quiz and semester examination.

Actual Work Effort: It is a measure of the degree to which students struggled to learn mathematical concepts. The average of the scores obtained from five homework is used as an indicator of actual work effort in mathematics.

Perceived Importance of Work Effort: It is measure of the degree to how student feels about the work effort which is related to achievement in mathematics. This variable was measured by the Effort as a Mediator of Mathematical Ability Scale (Kloosterman, 1988).

3.4 Variables

The variables of the present study will be presented for both research questions. There are three predictor variables in the first research question: self-confidence, actual work effort, and perceived importance of work effort. Moreover, achievement in mathematics score is the criterion variable in first research question. The variables are categorized as dependent and independent variables in the second research question. The dependent variables are

Mathematics achievement, self-confidence, actual work effort and perceived importance of work. The independent variables included in the second research question are students' gender.

3.5 Subjects of the Study

The subjects of the study 157 8th-grade students (87 boys, 70 girls) enrolled in seven classrooms from one private school. The study sample chosen from the accessible population was a sample of convenience. The study was carried out during the fall semester of 2005-2006 academic years.

Most of the students' socio-economic status, including the educational level of their parents, their family income and social life standards, could be assumed as high. Moreover, the ages of students ranged from 14 to 15.

3.6 Measuring Instruments

For this study, four measuring tools were used. These are confidence in learning mathematics scale, Effort as a Mediator of Mathematical Ability Scale, homework grade and mathematics achievement tests.

3.6.1 Confidence in Learning Mathematics Scale

Confidence in Learning Mathematics Scale used in this study was developed by Fennema and Sherman (1976) to measure confidence in one's ability

to learn and perform well on mathematical tasks. There were 12 items in the scale, 6 of them positively stated and 6 of them negatively stated. For example, some of the items are "I am sure that I can learn mathematics", "I can get good grades in mathematics", "and Generally I have felt secure about attempting mathematics". On this scale students are asked to respond each item by using a 5-point Likert scale (E= strongly disagree to A= strongly agree. The scale was adopted into Turkish by Tag (2000). The Cronbach alpha coefficient was found as 0.93 by Tag (2000). In the present study pilot study was also conducted for the scale, which was administered to 84 eighth grade students in Ankara. The Cronbach alpha for the scale used in this research study was 0.91.The possible scores can be between 12 and 60.

3.6.2 Effort as a Mediator of Mathematical Ability Scale

Effort as a Mediator of Mathematical Ability Scale, developed by Kloosterman (1988), had six items in order to measure the perceived importance of work effort variable. Items in original effort scale and the additional five items added by William (1997) were used in this study. The Cronbach Alpha coefficient was found as 0.82 William (1997). There were 11 items in the scale, 10 of them positively stated and 1 of them negatively stated. For examle, one of the item is "My ability in math will increase if I study hard", other one is "working hard is more important than individual ability for success in mathematics". On this scale students are asked to respond each item by using a 5-point Likert scale (E = strongly disagree to A = strongly agree). Since the scale was originally developed in English, translation of items necessitated to suit the students in the present

study. Firstly, the items of the scale were adapted into Turkish by the researcher and adapted scale was checked by a Turkish language teacher. Then, English language teacher translated some items back to English before the real testing situation.

A pilot study was also conducted for the scale; it was administered to 84 eight grade students in Ankara. After pilot study one item omitted from the scale, because it decrease the Cronbach alpha score and accordingly factor analyzes the item was excluded. The Cronbach alpha internal reliability score for the scale used in this research study was 0.77. According to Gay (2000), attitude scale reliabilities are usually in the range of 0.60 to 0.80.

3.6.3 Mathematics Achievement Tests

Data for dependent variables measuring mathematics achievement was collected, which included average of quiz scores and semester exam. Grades for quiz and semester exam were assigned by the researcher. There were 4 quizzes. Two of the quizzes included 19 multiple choice questions and other two quizzes included 20 multiple choice questions.

To establish the face and content validity, quizzes were checked by one elementary school mathematics teacher according to the content and format of the quizzes. The teacher was explained about the main purpose of the quizzes and then she evaluated quizzes according to the appropriateness of the items for the grade level and whether they are understandable.

As a pilot study of each quiz, 20 multiple choice questions were

administered to 84 eight grade students. The data were collected and a reliability analysis was performed with ITEMAN program. Internal reliability coefficients of each quiz were obtained as 0.87, 0.83, 0.82, and 0.86 by using Cronbach alpha coefficient. The criterion was that item having discrimination power less than 0.2 and item difficulty less than 0.1 or greater than 0.9 would be completely discarded. According to these criteria, the item discrimination power and item difficulty of each item were analyzed for each quiz. All questions in each quiz had appropriate item difficulty and item discrimination power. However, only 2 questions were omitted since they had no correct answer among choices. AT the end of the pilot study, quizzes took the final form. The reliability analysis as performed again according to the original data and the value of alpha was calculated as 0.89, 0.84, 0.83, and 0.85.

Semester exam was developed by the mathematics teachers of the school. The exam covered all topics studied during the semester, and was administered at the end of the semester (in December). The reliability analysis performed according to the original data and the value of alpha was calculated as 0.91. Because of this exam was carried out in all Private school Metu College in Turkey, I could not take item analyses. However item analyses reported to me all items provide above criteria from administration.

3.6.4 Homework Grade

Homework was given to determine the students' actual work effort in mathematics. Most of the reserach on work effort deals with self-reports on the

amount of time spent on homework (Holmes& Croll, 1989; Reimers, Fehrman, Potterbaum & Aubey, 1986). Cooper (1994), stated that ‘‘studies of time spent on homework typically rely on the self-reports of students. The accuracy of these may be questionable, possibly influenced by upward bias’’ (p.20). In addition in some study they are look just homework completion rates (William, 1997; Trautwein, Koller, & Schmitz, 2002). Instead of student-reported amount of time spent on homework (like most previous research studies), actual work effort was measured by the average of the scores obtained from five homework, during the semester. Grades for homework were assigned by the researcher. Homework included open ended questions. There were 5 homework assignments in total. They consisted of worksheets each contained 20-30 problems in varying degrees of difficulty. To establish the face and content validity, homework were checked by one elementary school mathematics teacher according to the content. Then she evaluated homework according to the appropriateness of items to the grade level and if they were understandable. For reliability of homework grade were assigned by the researcher and one teacher from the school. We looked their correlations and found high correlation (.95).

3.7 Procedure

After that, researcher translated “Effort as a Mediator of Mathematical Ability Scale” into Turkish. The instruments were checked by bilingual Turkish educators. Necessary permission was granted for application of the study. Then a pilot study of the translated scales were achieved in the middle of October 2005.

The scales were applied to 84 eight grade students. All feedback and criticism about the pilot study were analyzed. As a result of the pilot study, some arrangements were done on scales.

The Confidence in Learning Mathematics Scale used in this study, developed by Fennema and Sherman (1976) and adopted into Turkish by Tag (2000), was administered to 84 eight grade students as a pilot study.

Quiz questions were prepared according to the eight grade mathematics program (MEB, 2000). Each quiz was checked by a mathematics teacher from the school. Then, a pilot study of first quiz was conducted at the end of October and the pilot studies of other quizzes were achieved for every three week interval. Necessary changes were done according to the pilot study. One class hour was given to the students to complete each quiz. Quizzes were given in every three week interval throughout the semester. At the end of the semester, the semester examination, developed by the school administration, was applied to the students.

Nearly at the end of the semester, Confidence in Learning Mathematics Scale and Effort as a Mediator of Mathematical Ability Scale were administered. Twenty-five minutes was given to the students to complete these scales. The time was adequate for students. In order to have students relaxed and comforted the teachers read directions and made necessary explanations to them.

3.8 Analysis of Data

A data analysis of this study was conducted in following steps:

We begin by coding data, collected from the subjects then transfer them to computer environment with MS excel, SPSS package program and ITEMAN

program. Descriptive statistics such as mean and standard deviations of the subject were calculated for the scale score and for achievement test and for homework grade. The correlations among the variables were found for all students, for girls and for boys to determine interrelationships among the variables by using the Pearson Product Moment Correlations.

The stepwise multiple regression analysis gives information about how much of the variance in dependent variable can be explained by the independent variables. It also gives an indication of the relative contribution of each independent variable. It also explains the statistical significance of the results, both in terms of the model itself, and the individual independent variables.

The multivariate analysis of variance (MANOVA) was used to determine whether the groups differed significantly among themselves for gender.

We set $\alpha = 0.05$ as the probability of doing a Type I error.

3.9 Limitations of the Study

The study was subject to the following limitations:

1. The small sample size may affect the results because every individual carried a lot of weight. One student could have a greater impact on the results of the group than if there had been more students.
2. The results of this study were limited to eight graders in the private school in which the study was conducted. Therefore, the results are valid for the students that have the same characteristics.
3. The investigation was based on self-report data, which may be subject to bias.

3.10 Assumptions of the Study

The researcher made the following assumptions for this study:

1. This study assumed that the scales that measure self-confidence and the perceived importance of work effort accurately portray the beliefs of students.
2. It is assumed that all scales and the achievement tests are administered under standard conditions.
3. It is assumed that homework completion data includes only homework actually done by the students, working individually.

CHAPTER 4

RESULTS OF THE STUDY

In the previous chapters, the theoretical background of the study, the review of previous studies and the method of the present study were stated. In this chapter, the results of the analyses that are conducted to obtain statistical evidence for our claims will be presented. This chapter contains three sections. The first section presents the descriptive statistics. In the second, inferential statistics section, the results of the testing hypotheses associated to the problems are included. Finally, the third section of the chapter includes the conclusions derived from the present study.

4.1 Descriptive Statistics

Means and standard deviations of the variables for all students and for the female and male students are shown in the following Table 4.1.

Table 4.1 Means and Standard Deviations of Measures of the Study as Function of All Students and Gender

Variables	Out of	M_{total}	SD_{total}	M_{girls}	SD_{girls}	M_{boys}	SD_{boys}
ACH	100	64.126	19.762	62.507	19,124	65.429	20.277
CONF	60	44.586	11.104	42.014	10.586	46.655	11.137
AWE	100	56.496	22.333	57.021	22.483	56.073	22.333
PIWE	50	37.305	6.230	37.157	5.830	37.425	6.565

As seen in Table 4.1 mean scores of females were slightly higher than males for the variable of actual work effort. Conversely, mean scores for males were slightly higher for the variables achievement, self confidence in learning mathematics, and perceived importance of work effort.

By using the data in Table 4.1 the mean scores of the self-confidence and perceived importance of work about mathematics were converted into 5-point Likert-type scale. It is found that original 5-point Likert-type scale) range from 3.50 to 3.89. On the other hand, the mean scores for the perceived importance of work effort range from 3.71 to 3.74. In other words, they tend to reflect an “agree” perspective on the self-confidence and perceived importance of work.

4.2 Inferential Statistics

In this section, the problems of the present study will be examined by means of their associated hypotheses.

4.2.1 Results of Testing of First Problem

The first problem (P1) stated in the last chapter is: "How well can mathematics achievement be explained in terms of self-confidence, actual work effort, and perceived importance of work effort?"

In this part of the study three sub-problems of this problem will be examined by means of their associated hypotheses which are in the null form and tested at a significance level of 0.05.

4.2.1.1 Results of Testing of the Hypothesis of the First Sub-Problem

The first sub-problem of the first problem (P1.1) is the following: "What is the extent to which self-confidence, actual work effort, and perceived importance of work effort could account for all students' mathematics achievement?"

For investigating this sub-problem, one hypothesis is stated and is given below:

H1.1 The three variables together (self-confidence, actual work effort, and perceived importance of work effort) do not explain a significant amount of variance in all students' mathematics achievement.

Before testing the hypothesis assumptions of the Linear Stepwise Multiple Regression were tested.

The correlations among variables were found for total students to determine interrelationships among the variables the Pearson Product Moment Correlation Coefficients. The results are shown in table 4.2

Table 4.2 Intercorrelations among Measures for All Students

Variables	CONF	AWE	PIWE
ACH	0.665*	0.522*	0.130
	(0.000)	*(0.000)*	*(0.052)*
AWE	0.399*		0.120
	(0.000)		*(0.068)*
CONF			0.421*
			(0.000)

*Value is statistically significant with corresponding p-value shown in italics inside in brackets.

Table 4.2 shows that predictor variables-, self-confidence, actual work effort and perceived importance work effort- do not have high correlations among themselves. Therefore, we deduced that multicollinearity was not a problem for the present study.

There is no singularity because each independent variable is not a combination of other independent variables.

In the normal probability plot scores lie in a reasonably straight diagonal line from bottom left to top right. This suggests that no major deviations from normality.

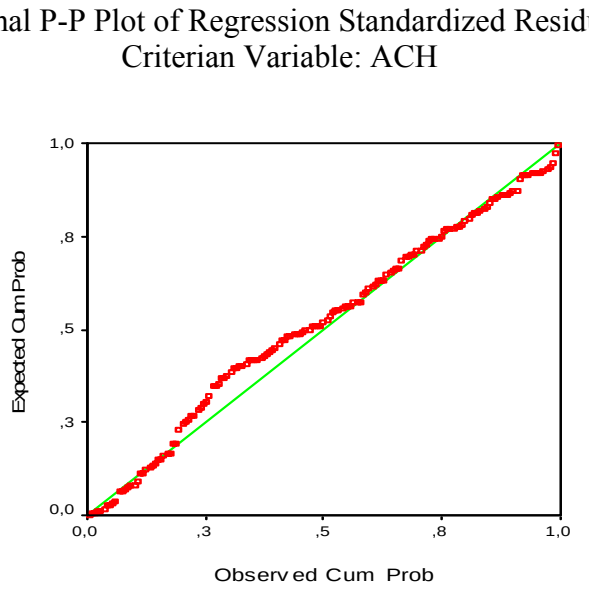


Figure 4.1 Normal cumulative probability plot of observed versus predicted standardized residuals for predictors of mathematics achievement

There are few outliers because there is few cases which have the standard residual values is about less than -3.3. There is also no case which has the standard residual values above 3.3. So it may not be necessary to accomplish any analysis.

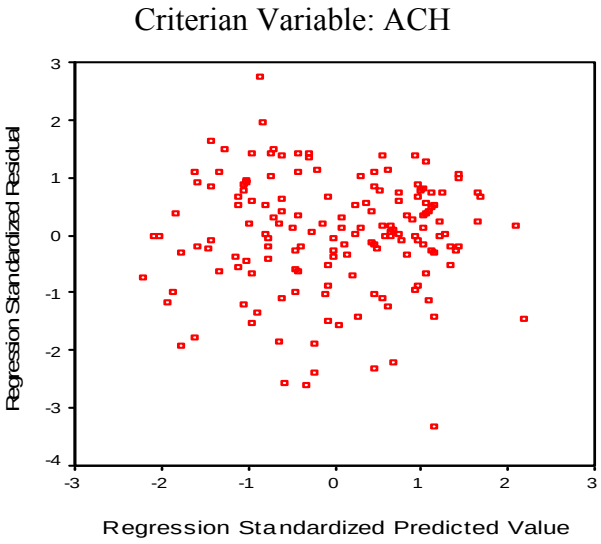


Figure 4.2 Residual plot (Y' vs. Y-Y') for predictors of mathematics achievement

The hypothesis (H1.1) were tested by using Linear Stepwise Multiple Regression. The results were given in Table 4.3.

Table 4.3 Linear Stepwise Regression Analysis Results for Combined Effect of Three Significant Predictor Variables on All Students' Mathematics Achievement

Regression Statistics					
R	0.737				
R^2	0.543				
Adjusted R^2	0.534				
Standard Error of Estimate	13.486				
Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	33100.782	3	11033.594	60.671	0.000*
Residual	27824.690	153	181.861		
Total	60925.472	156			

* $p < 0.05$

As Table 4.3 indicates, the three predictors together (self-confidence, actual work effort, and perceived importance of work effort) could explained a significant amount of variance in all students' mathematics achievement. 54.3 percent of the variances in mathematics achievement are explained by these variables together.

Table 4.4 Linear Stepwise Regression Analysis of All Students' Mathematics Achievement on Self-Confidence, Actual Work Effort, and Perceived Importance of Work Effort

Model	R^2	R Square Change	Std. Error of Estimate	Adjusted R^2	df1	df2	F	Sig. F Change
1	0.442	0.442	14.804	0.439	1	155	123.01	0.000
2	0.521	0.079	13.763	0.515	1	154	25.31	0.000
3	0.543	0.022	13.486	0.534	1	153	7.411	0.007

a) Predictors: (Constant), CONF
b) Predictors: (Constant), CONF, AWE
c) Predictors: (Constant), CONF, AWE,PIWE

The self-confidence was the strongest significant predictor of all students' mathematics achievement, accounting for 44.2 % of the variance in all students' ACH scores *for model 1*. The actual work effort accounts for an additional 7.9 % of the variance in their ACH scores, *for model 2*. Last, perceived importance of work effort accounts for an additional of the variance in their ACH scores, 2.2%, *for model 3.*

The individual effect of each predictor can be seen in Table 4.5. According to this table, self-confidence, actual work effort, and perceived importance of work effort explain individually a significant amount of variance in all students mathematics achievement ($p < 0.05$).

Table 4.5 Linear Stepwise Regression Analysis Results for Individual Effects of Three Significant Predictor Variables on All Students' Mathematics Achievement

Variables	Standardized Coefficients	Standard Error	t-value	p-value
CONF	0.616	0.116	9.434*	0.000
AWE	0.296	0.053	4.969*	0.000
PIWE	-0.164	0.191	-2.722*	0.007

*$p < 0.05$

Using Table 4.5, a linear stepwise regression equation can be written in order to estimate all students' mathematics achievement from three significant predictors. The regression equation with three predictors is significantly related to all students' mathematics achievement.

This equation is:

$$Y = 0.616\ X_1 + 0.296\ X_2 - 0.164\ X_3$$

Where Y represents the predicted mathematics achievement and X_1, X_2, and X_3 represents self-confidence, actual work effort, and perceived importance of work effort respectively.

4.2.1.2 Results of the Hypothesis of the Second Sub-Problem

The second sub-problem of the first problem (P1.2) is the following: "What is the extent to which self-confidence, actual work effort, and perceived importance of work effort could account for girls' mathematics achievement?"

For investigating this sub-problem, one hypothesis is stated and is given below:

H1.2 The three variables together (self-confidence, actual work effort, and perceived importance of work effort) do not explain a significant amount of variance in girls' mathematics achievement.

Before testing the hypothesis assumptions of the Linear Stepwise Multiple Regression were tested.

The correlations among variables were found for total students to determine interrelationships among the variables the Pearson Product Moment Correlation Coefficients.

Table 4.6 Pearson Product Moment Correlations among Measures for Girls

Variables	CONF	AWE	PIWE
ACH	0.666*	0.476*	0.124
	(0.000)	*(0.000)*	*(0.154)*
CONF		0.433*	0.514*
		(0.000)	*(0.000)*
AWE			0.216
			(0.036)

*Value is statistically significant with corresponding p-value shown in italics inside in brackets.

Table 4.6 shows that predictor variables- self-confidence, actual work effort, and perceived importance of work effort- do not have high correlations among themselves. Therefore, we deduced that multicollinearity was not a problem for the present study.

There is no singularity because each independent variable is not a combination of other independent variables.

In the normal Probability Plot scores lie in a reasonably straight diagonal line from bottom left to top right. This suggests that no major deviations from normality.

Normal P-P Plot of Regression Standardized Residual
Criterian Variable: ACH

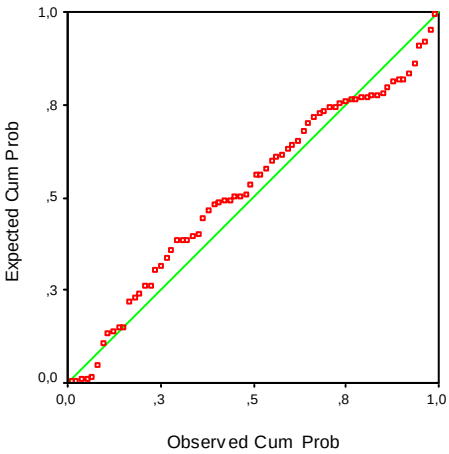


Figure 4.3 Normal cumulative probability plot of observed versus predicted standardized residuals for predictors of girls' mathematics achievement

There is not outlier because there is no case which have standard residual value about above 3.3 and less than -3.3.

Criterian Variable: ACH

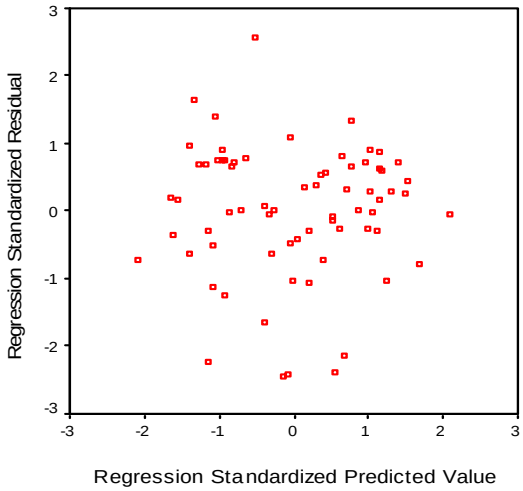


Figure 4.4 Residual plot (Y' vs. Y-Y') for predictors of girls mathematics achievement

The hypothesis (H1.2) were tested by using Linear Stepwise Multiple Regression. The results were given in table 4.7.

Table 4.7 Linear Stepwise Regression Analysis Results for Combined Effect of Three Significant Predictor Variables on Girls' Mathematics Achievement

Regression Statistics					
R	0.743				
R^2	0.551				
Adjusted R^2	0.531				
Standard Error of Estimate	13,09712				
Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	13913.725	3	4637.908	27.038	0.000*
Residual	11321.276	66	171.534		
Total	25235.001	69			

* $p < 0.05$

As Table 4.7 indicates, the three predictors together (self-confidence, perceived importance of work effort and actual work effort) explains a significant amount of variance in girls' mathematics achievement. 55.1 percent of the variances in mathematics achievement are explained by these variables together.

The individual effect of each predictor can be seen in Table 4.8 According to this table, self-confidence, perceived importance of work effort and actual work effort explain individually a significant amount of variance in mathematics achievement ($p < 0.05$).

Table 4.8 Linear Stepwise Regression Analysis Results for Individual Effects of Three Significant Predictor Variables on Girls' Mathematics Achievement

Variables	Standardized Coefficients	Standard Error	t-value	p-value
CONF	0.719	0.188	6.906	0.000*
PIWE	-0.295	0.315	-3.067	0.003*
AWE	0.229	0.078	2.505	0.015*

*$p < 0.05$

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

This equation is:

$$Y = 0.719\ X_1 - 0.295\ X_3 + 0.229\ X_2$$

Where Y represents the predicted mathematics achievement and X_1, X_3, and X_2 represents self-confidence, perceived importance of work effort, and actual work effort.

Table 4.9 Linear Stepwise Regression Analysis of Girls' Mathematics Achievement on Self-Confidence, Perceived Importance of Work Effort and Actual Work Effort

Model	R^2	Adjusted R^2	Std. Error of Estimate	df1	df2	R^2 Change	F Change	Sig. F Change
1	0.444	0.436	14.36454	1	68	0.444	54.298	0.000*
2	0.509	0.494	13.60297	1	67	0.065	8.827	0.004*
3	0.551	0.531	13.09712	1	66	0.043	6.275	0.015*

a Predictors: (Constant), CONF
b Predictors: (Constant), CONF, PIWE
c Predictors: (Constant), CONF, PIWE, AWE

The self-confidence was the strongest significant predictor of girls' mathematics achievement, accounting for 44.4 % of the variance in ACH scores, *for model 1*. The perceived importance of work effort accounts for an additional 6.5 % of the variance in their ACH scores, for model 2 . Last, the actual work effort accounts for an additional 4.3 % of the variance in their ACH scores, for model 3.

4.2.1.3 Results of the Hypothesis of the Third Sub-Problem

The Third sub-problem of the first problem (P1.3) is the following: "What is the extent to which self-confidence, actual work effort, and perceived importance of work effort could account for boys' mathematics achievement?"

For investigating this sub-problem, one hypothesis is stated and is given below:

H1.2 The three variables together (self-confidence, actual work effort, and perceived importance of work effort) do not explain a significant amount of variance in boys' mathematics achievement.

Before testing the hypothesis assumptions of the Linear Stepwise Multiple Regression were tested.

The correlations among variables were found for total students to determine interrelationships among the variables the Pearson Product Moment Correlation Coefficients.

Table 4.10 Pearson Product Moment Correlations among Measures for Boys

Variables	CONF	AWE	PIWE
ACH	0.666*	0.564*	0.133
	(0.000)	*(0.000)*	*(0.110)*
CONF		0.397*	0.367*
		(0.000)	*(0.000)*
AWE			0.051
			(0.318)

*Value is statistically significant with corresponding p-value shown in italics inside in brackets.

Table 4.10 shows that predictor variables- self-confidence, actual work effort, and perceived importance of work effort- do not have high correlations among themselves. Therefore, we deduced that multicollinearity was not a problem for the present study.

There is no singularity because each independent variable is not a combination of other independent variables.

In the normal Probability Plot scores lie in a reasonably straight diagonal line from bottom left to top right. This suggests that no major deviations from normality.

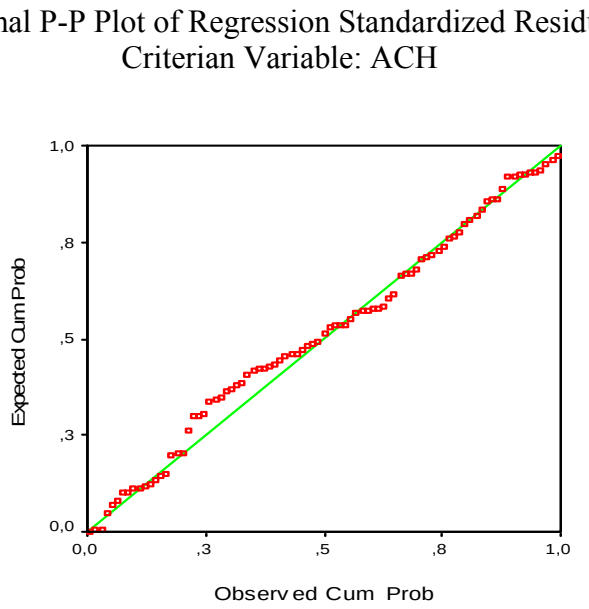


Figure 4.5 Normal cumulative probability plot of observed versus predicted standardized residuals for predictors of boys' mathematics achievement

There is not outlier because there is no case which have standard residual value about above 3.3 and less than -3.3.

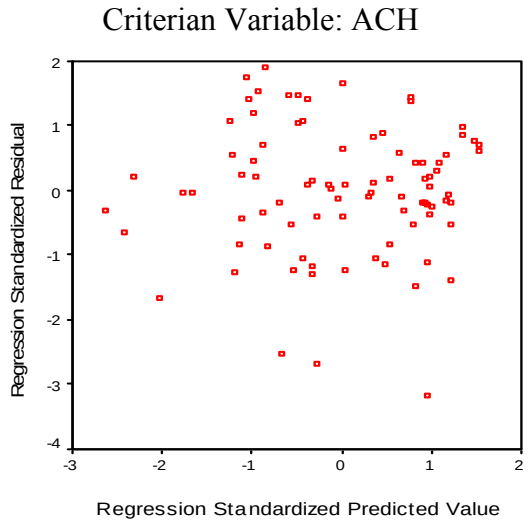


Figure 4.6 Residual plot (Y' vs. Y-Y') for predictors of boys mathematics achievement

The hypothesis (H1.3) was tested by using Linear Stepwise Multiple Regression. The results were given in Table 4.11.

Table 4.11 Linear Stepwise Regression Analysis Results for Combined Effect of Two Significant Predictor Variables on Boys' Mathematics Achievement

Regression Statistics					
R	0.742				
R^2	0.550				
Adjusted R^2	0.539				
Standard Error of Estimate	13.76145				
Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	19451.489	2	9725.744	51.356	0.000
Residual	15907.713	84	189.378		
Total	35359.202	86			

* $p < 0.05$

As Table 4.11 indicates, the two predictors together (self-confidence and actual work effort) explains a significant amount of variance in boys' mathematics

achievement. 55 percent of the variances in mathematics achievement are explained by these variables together.

The individual effect of each predictor can be seen in Table 4.12. According to this table, self-confidence and actual work effort explain individually a significant amount of variance in mathematics achievement
($p < 0.05$).

Table 4.12 Linear Stepwise Regression Analysis Results for Individual Effects of Three Significant Predictor Variables on Boys' Mathematics Achievement

Variables	Standardized Coefficients	Standard Error	t-value	p-value
CONF	0.525	0.145	6.588	0.000*
AWE	0.355	0.072	4.456	0.000*

*$p < 0.05$

Using Table 4.12 a linear stepwise regression equation can be written in order to estimate boys' mathematics achievement from three significant predictors. The regression equation with three predictors is significantly related to mathematics achievement.

This equation is:

$$Y = 0.525\ X_1 + 0.355\ X_2$$

Where Y represents the predicted mathematics achievement and X_1, and X_2 represents self-confidence and actual work effort.

Table 4.13 Linear Stepwise Regression Analysis of Boys' Mathematics Achievement on Self-Confidence, Perceived Importance of Work Effort and Actual Work Effort

Model	R^2	R^2 Change	Std. Error of Estimate	Adjusted R^2	df1	df2	F Change	Sig. F Change
1	0.444	0.444	15.21147	0.437	1	85	67.813	0.000
2	0.550	0.106	13.76145	0.539	1	84		0.000

a Predictors: (Constant), CONF
b Predictors: (Constant), CONF, AWE

As seen in Table 4.13 the self-confidence was the strongest significant predictor of boys' mathematics achievement, accounting for 44.4 % of the variance in ACH scores. Last, the actual work effort accounts for an additional 4.3 % of the variance in their ACH scores . The perceived importance of work effort accounts were not in the table because it is excluded (t=1.153, p=0.252).

4.2.2 Results of Testing of Second Problem

The second problem (P2) stated in the last chapter is: **“** Is there any mean difference between girls and boys with respect to mathematics achievement self-confidence, actual work effort, and perceived importance of work effort?”

In order to examine the sub-problems of the second problem, the following three hypothesis is stated respectively. This hypothesis is stated in the null form and tested at a significance level of 0.05.

The second problem is examined by the following hypothesis:

H2. There is no significant mean difference between girls and boys with respect to mathematics achievement self-confidence, actual work effort, and perceived importance of work effort.

One hypothesis is stated to investigate the above problem. In order to test this hypothesis we used MANOVA with gender as independent variable, and mathematics achievement, self-confidence, actual work effort, and perceived importance of work effort as dependent variables. The MANOVA assumptions are tested:

In the Box's Test of Equality of Covariance Matrices the significance value is greater than 0.001 so that the assumption of homogenity of varance-covariance is not violated (Box’s M= 8.601; F= 8.36; p=0.594). In other words, the observed covariance matrices of the dependent variables are equal across groups.

The results of Levene’s test of Equality of Error Variances are given in Table 4.14.

Table 4.14 Levene's Test of Equality of Error Variances

Variables	F	df1	df2	Sig.
ACH	0.120	1	155	0.729
CONF	0.183	1	155	0.669
AWE	0.010	1	155	0.920
PIWE	0.155	1	155	0.694

As seen in Table 4.14 we do not violated the assumption of equality of variance for each variable. Therefore, we can assume equal variances.

As a result of the MANOVA, Wilks' Λ reveals that there is an overall significant mean difference among the mean scores of the three dependent variables with respect to gender *(Wilks' Λ=0.93, F(1,155)=2.733, p=0.03).*

Univariate ANOVA for each dependent variable with respect to gender is conducted for follow-up tests. The results of Univariate ANOVA for all variables of the present study are given in Table 4.15.

Table 4.15 The Results of Univariate ANOVA for self-confidence, actual work effort, and perceived importance of work effort.

Source	Dependent Variable	F	Sig.	Partial η^2
GENDER	ACH	0.847	0.359	0.005
	CONF	7.037	0.009	0.043
	AWE	0.069	0.793	0.000
	PIWE	0.071	0.790	0.000

*$p \leq 0.05$

Results of Univariate ANOVA indicate that a significant mean difference in self-confidence scores with respect to gender *(F (1,157) =7.037, p=0.009).* The effect size is 0.043. This means that it is medium effect size. It also indicates that 4.3 percent of variance in CONF scores was explained by gender.

As seen in Table 4.1, boys' mean score of self-confidence are significantly higher than girls' mean scores of self-confidence *($Mean_{boys}$*=46.655, *SD_{boys}*=11.137; *$Mean_{girls}$*=, 42.014, *$SD_{girls=}$*10.586*).*

Table 4.15 also indicates that there is no significant mean difference in ACH scores with respect to gender *(F (1,155)=0.847, p=0.359).* As seen in Table 4.1 boys' mean score of ACH is higher than girls' mean score of ACH *($Mean_{boys}$*= 65.429*, SD_{boys}*= 20.277*; $Mean_{girls}$* =62.507*, SD_{girls}*= 19.124*).*

As seen in Table 4.15 demonstrates that there is also no significant mean difference in actual work effort with respect to gender *(F (1,155)* = 0.06*, p*=0.793*).* However, as seen in Table 4.1 girls' mean score of AWE is slightly

higher than boys' mean score of AWE *(*$Mean_{girls}$=57.021*,* SD_{girls}=22.483; $Mean_{boys}$= 56.073*,* SD_{boys}= 22.333).

Table 4.15 shows that there is no significant mean difference in perceived importance of work effort with respect to gender *(F (1,155)*= 0.071*, p*=0.790*).* As seen in Table 5.1 girls' and boys mean scores of PIWE are almost equal to each other *(*$Mean_{boys}$= 37.425*,* SD_{boys}= 6.565; $Mean_{girls}$=37.157*,* SD_{girls}=5.830 *;).*

CHAPTER 5

DISCUSSION, IMPLICATIONS, AND RECOMMENDATIONS

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

5.1 Discussion

The purposes of the study were: (1) to predict the eight grade students' mathematics achievement with self-confidence in mathematics, actual work effort in mathematics, and perceived importance of work effort in mathematics and mathematics achievement at elementary school level, and (2) to investigate the gender differences with respect to those variables. In this section the results of these analyses will be discussed.

5.1.1 Discussion of the Results Regression Analysis

In the present study 54.3 percent of the variances in all students' mathematics achievement were explained by self-confidence, actual work effort, and perceived importance of work effort these variables together. However, William (1997) who found that 49 percent of the variances in all students' mathematics achievement were explained with only AWE and CONF.

In the present study the self-confidence was the strongest significant predictor of all students' mathematics achievement, accounting for 44.2 % of the variance in all students' ACH scores. This may happened because the confident students can tend to learn more, feel better about them and more interested in pursuing mathematical ideas. Students who are sure of their ability in mathematics will probably more highly motivated to study mathematics than are students with low self confidence in mathematics. However, the finding was not consistent with William (1997) who found that the actual work effort was the strongest significant predictor of all students' mathematics achievement instead of self-confidence. In his study confidence was the second significant predictor.

Another variable studied in the present study was actual work effort which accounted for an additional 7.9 % of the variance in their ACH scores. However, William (1997) found that actual work effort was the strongest significant predictor of all students' mathematics achievement, accounting for 43 % of its variance was explained.

While in the study the perceived importance of work effort accounted for an additional 2.2 % of the variance in their ACH scores, Kloosterman (1988) found perceived importance of work effort accounted for an additional 8 % of the variance. However, in the William' (1997) study the PIWE was excluded.

In Turkish girls' mathematics achievement model there were self-confidence, perceived importance of effort and actual work effort but the model for boys included self-confidence and effort. While in the first model 55.1 percent variance were explained with three variables, in the second model 55 percent variance were explained with two variables stated. Therefore, the variables in two equations were not completely the same and their effects were different. In Williams' (1997) study for girls there is only one variable entered into equation. It was actual work effort. In the model of the boys in the same study included actual work effort and self-confidence.

Although the models of Turkish students' mathematics achievement were different with respect to gender, for both girls and boys the self confidence was the strongest predictors which accounted for 44.4 percent of the variance in ACH scores. In William's (1997) study while the model of the girls' mathematics achievement the self-confidence was not included, for boys it was the second predictor which accounted 7 percent variance in mathematics achievement.

While the actual work effort of girls in the present study accounted for an additional 4.3 percent of the variance in their ACH scores, this value was 10.6 percent for boys. In the present study while the girls' perceived importance of work effort accounted for an additional 6.5 % of the variance in their ACH scores, for boys this psychological variable was excluded. In Williams' study this variable was

excluded for both genders. We may interpret the findings of the present study, the boys may think that their ability were enough to be successful.

5.1.2 Discussion on the Results of MANOVA

The investigation of gender difference is very difficult because there are so many diverse, interacting variables involved. But in the study we wanted to determine overall situation.

In the present study there was no gender difference with respect to achievement ($Mean_{girls}$=62.507, SD_{girl}= 19,124; $Mean_{boys}$ 65.429, SD_{boys}= 20.277, $p>0.05$). Although this result was consistent with the findings of William (1997) Curlo (1987), Szetela and Super (1987), Smith and Walker (1988), Ethington, (1990) and Tartre and Fennema (1995), it is not consistent with the findings of Fennema and Sherman (1977), Benbow and Stanley (1980), Fennema and Carpenter (1981), Linn and Pulos (1983), Ethington and Wolfle (1984), Hana (1986), Eccles and Jacobs (1986), Moore and Smith (1987), Hart (1989) and Frost et al. (1994). The reason for not finding gender difference and having small difference in the mean scores could be that their socio economic status was high because the subjects of the present study enrolled to private school.

In the present study there was a significant mean difference between girls and boys with respect to self-confidence in the favour of boys. In other words, boys ($Mean_{boys}$=46.655, SD_{boys}=11.137) were more confident than girls ($Mean_{girls}$=42.014, SD_{girl}= 10.586) this result is consistent with the findings of Kloosterman (1988), Betz and Hackett (1983), Eccles and Jacobs, 1986, Pedersen et. al. (1985), Matsui, Matsui

and Ohnishi (1990) and William (1997). There can be many reasons for this result. One of them is that teachers might have a stereotype on mathematics as a boy domain. So teachers could have a tendency to overrate boy students' mathematics capability. They also might have higher expectations for boy students, and more positive attitudes about them.

There was no significant mean difference in actual work effort with respect to gender in the present study. The result of our study is consistent with the findings of William (1997). However, while the AWE mean score of Turkish girls is slightly higher than boys' mean score of AWE, in William study this situation was the opposite. Mau and Lynn (2000), Keith (1982), and Trautwein, Koller, and Schmitz (2002), they found the same result that is girls do more homework than boys. This difference may have resulted from girls have stronger work ethic than boys which motivated them to expend greater effort on course work. This explanation can be valid for the present study too. In the research study the PIWE mean scores of girls were very close to the mean for boys of ($Mean_{girls}$ =37.157, SD_{girls}=5.830; $Mean_{boys}$=37.425 SD_{boys}=6.565).

5.2 Internal and External Validity

In this section, the internal and external validity of the present study will be discussed and how the threats to internal and external validity are controlled will be explained.

5.2.1 Internal Validity of the Study

Internal validity is concerned with ensuring that observed differences on the dependent variable are a direct result of manipulation of the independent variable, but not some other unintended variable (Fraenkel & Wallen, 1996). One possible threat to internal validity of a study is subject characteristic (Fraenkel & Wallen, 1996). In the present study, students were at the same grade level and the number of girls and boys were almost equal. Hence those characteristics did not affect research results unintentionally. As mentioned previously the subject were selected from private school students, therefore students' socioeconomic backgrounds, which may affect results of the study, were almost the same in the present study.

The particular locations which data are collected are called a location threat (Fraenkel & Wallen, 1996). In the present study location could not be a problem for the internal validity. The classroom settings in which data were collected were similar to each other.

Mortality threat is known as lose of subjects in the study progress (Fraenkel & Wallen, 1996). In the present study mortality could not be a problem for the internal validity. Subjects were not known when they were get attitude scales and achievement test.

The way in which instruments are used may also constitute a threat to internal validity of the study (Fraenkel & Wallen, 1996). Instrument decay, data collector characteristics, and data collector bias could not be problems to internal validity. The

computer read data. Since data collector characteristics were not related to the variables being investigated.

Since the present study is not an intervention or experimental study testing, maturation, regression, implementation could not be problem for the internal validity. Because there were not any unplanned occasions during the implementation of the attitude scales and achievement test, history could not be a problem for the internal validity. The names of the students were collected but they were only used for matching the attitude scales and achievement test answered by the same participant. It was remembered to students repeatedly that their answers would not be seen by anybody except the researcher. So, confidentiality was satisfied.

5.2.2 External Validity of the Study

External validity is the, results of a study can be extended to other settings or conditions (Fraenkel & Wallen, 1996). Since sample size was not big enough generalizations of the findings of the study were limited. On the other hand, generalization can be done on subjects having the same characteristics.

5.3 Implications

In this section, the implications of the present research can be stated as follows:

Teacher should be creating such a classroom environment that builds self confidence. Students should be realized that mistakes are part of the learning process. Student can be face with the different teaching method of mathematics and can

actively engage in learning process. Teacher should provide that students see mathematics from different perspective. Teacher at all levels need to be concerned about equity. All students deserve the same change for success in mathematics.

Teacher should convince students that effort is important to achieve success in mathematics. Then ensure that students are working hard. Teacher should be aware of the causes of success and failure of the students' achievements and should talk with the students about causes of their success and failure. Parents should be cooperate with teachers, encourage their child and confident their child ability.

5.4 Recommendations for Further Research

Followings are some recommendations for further research:

The sample size can be increased in further studies. A replication of this study should be implemented using other grade levels and other school population. A similar study should be conducted with other subject areas (e.g., physics, chemistry, etc.).

Different measures of actual work effort need to be developed and tested in actual classrooms. An experimental design could be developed to better analyze the interactions themselves, not just their combined Predictive effects like this study. Another area for additional research would be analyzing what makes some students work harder in mathematics than other students.

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APPENDIX A

Bu ölçekte, bir dizi cümleler yer almaktadır. Bu cümlelerin doğru cevapları bulunmamaktadır. Bu cümleler, ifade edilen düşüncelere sizin ne derece katılıp katılmadığınızı belirtmenize olanak verecek şekilde düzenlenmiştir. Diyelim ki cümle şöyle:

Örnek: Matematiği severim.

Böyle bir cümleyi okuduğunuzda bu düşünceye katılıp katılmadığınızı biliyor olacaksınız. Eğer bu düşünceye kesinlikle katılıyorsanız cevap olarak "Kesinlikle katılıyorum." seçeneğini işaretleyiniz. Eğer sadece katılıyorsanız "Katılıyorum." seçeneğini işaretleyeceksiniz. Eğer cümlede belirtilen düşünceye katılmıyorsanız, ne derece katılmadığınızı göstermek için; düşünceye sadece katılmamanız durumunda "Katılmıyorum." seçeneğini, kesinlikle karşı olmanız durumunda "Kesinlikle katılmıyorum." seçeneğini işaretleyiniz. Fakat, ifade edilen düşünce hakkında olumlu ya da olumsuz bir görüş belirtmiyorsanız, yani, kararsızsanız "Kararsızım." seçeneğini işaretleyiniz.

Hiçbir cümlede fazla zaman kaybetmeden hızlı fakat dikkatli okuyarak **her cümleyi** cevaplayınız.

Doğru ya da yanlış cevap bulunmamaktadır. Yalnızca sizin doğru bulduğunuz cevaplar doğru kabul edilmektedir. Mümkün olduğunca, yaşadıklarınızı düşünerek karar veriniz.

Matematik Öğrenmede Kendine Güven Ölçeği

	Kesinlikle Katılıyorum.	Katılıyorum.	Kararsızım.	Katıl**mı**yorum.	Kesinlikle Katıl**mı**yorum.
1. Matematik çalışmalarında genellikle kendime güvenirim.					
2. İleri düzeyde matematik çalışabileceğime eminim.					
3. Matematikte başarılı değilimdir.					
4. Daha zor matematiği yapabileceğimi düşünüyorum.					
5. Matematikten iyi notlar alabilirim.					
6. Çalıştığım halde, bazı nedenlerden dolayı matematik bana çok zor geliyor.					
7. Matematik öğrenebileceğime eminim.					
8. İleri düzeyde matematiği yapabileceğimi zannetmiyorum.					
9. Matematikte başarılı olabilecek biri değilim.					

10. Matematik söz konusu olduğunda, kendime çok güvenirim.					
11. Çoğu dersin üstesinden gelebilirim; fakat matematiği yapabilecek yeteneğim yoktur.					
12. Matematik her zaman en başarısız olduğum bir alandır.					

Çalışmanın Öneminin Algılanmasının Ölçeği

	Kesinlikle Katılıyorum.	Katılıyorum.	Kararsızım.	Katı**lmı**yorum.	Kesinlikle Katıl**mı**yorum.
13. Kendimi zorladığımda matematikte daha zeki olabilirim.					
14. Matematikte başarılı olmak için çok çalışmak, bireysel yeteneklerden daha önemlidir.					
15. Matematiği iyi yapıyorsan çok çalışmana gerek yok.					
16. Matematik öğretmenim ileri matematiği yapabileceğime inanıyor.					
17. Çalışmak, matematik yeteneğimi geliştirebilir.					
18. Matematiği yapmakta iyi değilsen, çok çalışman gerekir.					
19. Matematikte matematik öğretmenimin düşündüğünden daha yetenekliyim.					
20. Matematikte daha zeki olabiliyorum eğer kendimi zorlarsam.					
21. Çok çalışmak matematik yapabilme yeteneğimi arttırabilir.					
22. Matematikte daha zeki olabiliyorum eğer kendimi zorlarsam.					

APPENDIX B

RASYONEL SAYILAR VEONDALIKLI SAYILAR

1)

işleminin sonucu kaçtır?

A) 6 B) 5 C) 3 D) 2

2) $a = \frac{7}{2}$, $b = \frac{13}{6}$, $c = \frac{7}{3}$ sayılarının doğru sıralanışı aşağıdakilerden hangisidir?

A) a < b < c B) b < c < a
C) a < c < b D) a < c < b

3) $\frac{\left(1-\frac{1}{2}\right)^{-1}+1}{\left(1-\frac{1}{3}\right)^{-2}-3}$

işleminin sonucu kaçtır?

A) –4 B) –6 C) –11 D) –12

4) Aşağıdakilerden hangisi doğrudur?

A) Payı paydasından büyük olan kesirler basit kesirdir.

B) Rasyonel sayılar tamsayıların alt kümesidir.

C) En küçük bileşik kesir 1 dir.

D) En büyük bileşik kesir 1 dir.

5) $\frac{2^{-1}+3^{-1}}{4^{-1}+6^{-1}} : \frac{1}{2}$ işleminin sonucu kaçtır?

A) 1 B) 2 C) 3 D) 4

6) Payı paydasından 6 fazla olan bir kesir üzerinde aşağıdaki işlemlerden hangisi yapılırsa kesir basit kesre dönüşür?

A) Pay ve paydasından payda çıkarılırsa
B) Pay ve paydasından 6 çıkarılırsa
C) Payı paydasına eklenirse
D) Pay ve payda payda ile çarpılırsa

7) $\dfrac{\left(5+\frac{1}{4}\right)-\left(\frac{1}{4}-5\right)}{\left(3-\frac{1}{3}\right)+\left(\frac{1}{3}+2\right)}$

işleminin sonucu kaçtır?

A) 1 B) 2 C) 3 D) 4

8) $\dfrac{0,125}{0,5}=\dfrac{0,1}{x}$ ise x in değeri kaçtır ?

A) 0.1 B)0, 2 C) 0,3 D) 0,4

9)

$$3-\cfrac{1}{1-\cfrac{1}{2-\frac{1}{2}}}$$

işleminin sonucu kaçtır?

A) –2 B) –1 C) 0 D) 1

10) Aşağıdaki ifadelerden hangisi yanlıştır?

A) $+\frac{2}{9}$ un toplama işlemine göre tersi $-\frac{2}{9}$ dur.

B) $-\frac{9}{2}$ nin çarpma işlemine göre tersi $-\frac{2}{9}$ dur.

C) $-\frac{9}{2}$ nin toplama işlemine göre tersi $\frac{9}{2}$ dir.

D) $+\frac{2}{9}$ un çarpma işlemine göre tersi $-\frac{9}{2}$ dir.

11) $\dfrac{300.0,002}{0,0002}$ işleminin sonucu kaçtır?

A) 2000 B) 3000 C) 4000 D) 6000

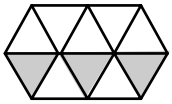
12) x ve y devirli ondalık sayılar olmak üzere

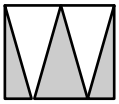
$x = 0,\overline{3}$ ve $y = 0,\overline{5}$ ise

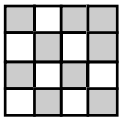
$\frac{1}{x}+\frac{1}{y}$ toplamı kaçtır?

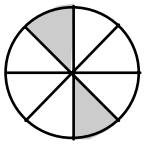
A) 4 B) 4,2 C) 4,4 D) 4,8

13) Aşağıda verilen bütünlerin her biri eşit parçalara ayrılmıştır. Buna göre hangi şekil $\frac{99}{176}$ kesrine karşılık gelir?

A) 

B) 

C) 

D) 

14) **işleminin sonucu kaçtır?**

A) 0,2 B) 1,2 C) 1,3 D) 1,5

15) işleminin sonucu kaçtır?

A) $\frac{1}{2}$ B) 1 C) $\frac{3}{2}$ D) 2

16) $\frac{0,006+0,06+0,6}{0,003+0,03+0,3}$ işleminin sonucu kaçtır?

A) 0,2 B) 0,3 C) 2 D) 3

17) Aşağıdaki eşitliklerden hangileri doğrudur?

I. $0,\bar{4}=\frac{4}{10}$

II. $2,\bar{3}=2\frac{1}{3}$

III. $0,05=\frac{1}{20}$

IV. $0,2\bar{9}=\frac{3}{5}$

A) I ve II B) II ve III
C) I ve III D) II ve IV

18) 4,3 □ 7 < 4,358 sıralamasının doğru olması için □ basamağına yazılabilecek rakamların kümesi aşağıdakilerden hangisidir?

A) {1, 2, 3, 4} B) {6, 7, 8, 9}
C) {0, 1, 2, 3, 4, 5} D) {5, 6, 7, 8, 9}

19) Aşağıdakilerden hangisi doğrudur?

A) $6,2006=6+\frac{2}{10}+\frac{6}{10^2}$

B) $4,2021=4+\frac{2}{10}+\frac{2}{10^2}+\frac{1}{10^4}$

C) $5,3205=5+\frac{3}{10}+\frac{2}{10^2}+\frac{5}{10^3}$

D) $2,3015=2+\frac{3}{10}+\frac{1}{10^3}+\frac{5}{10^4}$

KÖKLÜ SAYILAR

1) $3\sqrt{12}-4\sqrt{75}+2\sqrt{27}$ işleminin sonucu kaçtır?

A) $-4\sqrt{3}$ B) $-5\sqrt{3}$

C) $-6\sqrt{3}$ D) $-8\sqrt{3}$

2) $\sqrt{2}.\sqrt{3}.\sqrt{10}.\sqrt{15}$ çarpımının sonucu kaçtır?

A) 30 B) 24 C) 20 D) 15

3) $\dfrac{\sqrt{7-4\sqrt{3}}\cdot\sqrt{7+4\sqrt{3}}}{\sqrt{2}}$ işleminin sonucu kaçtır?

A) $2\sqrt{2}$ B) $\sqrt{2}$ C) 1 D) $\dfrac{\sqrt{2}}{2}$

4) $(A-1).\sqrt{B-2}=18$ ifadesi için aşağıdakilerden hangisi doğrudur?

A) $A=9$ ise $B=1$ dir.

B) $A=7$ ise $B=11$ dir.

C) $A=3$ ise $B=9$ dur.

D) $A=2$ ise $B=8$ dir.

5) $a=\sqrt{2}$, $b=\sqrt{3}$ ve $c=\sqrt{12}$ ise $\dfrac{c^2}{a^2\cdot b}$ ifadesinin değeri aşağıdakilerden hangisidir?

A) $4\sqrt{3}$ B) $3\sqrt{3}$ C) $2\sqrt{3}$ D) $\sqrt{3}$

6) $\dfrac{10}{\sqrt{5}}$ sayısı için aşağıdakilerden hangisi **yanlıştır**?

A) $2\sqrt{5}$ e eşittir.

B) $\sqrt{5}$ katı 10 dur.

C) $\sqrt{5}$ e bölümü 2 dir.

D) Çarpmaya göre tersi $\sqrt{5}$ tir.

7) $\sqrt{4+\sqrt{18+\sqrt{43+\sqrt{36}}}}$ işleminin sonucu kaçtır?

A) 3 B) 4 C)5 D) 6

8) $\sqrt{135}-\sqrt{60}$ farkının sayısal değerini bulmak isteyen bir öğrenciye aşağıdakilerden hangisinin sayısal değeri verilmelidir?

A) $\sqrt{2}$ B) $\sqrt{3}$ C) $\sqrt{5}$ D) $\sqrt{15}$

9)

Problem :

$\sqrt{0,64}+\sqrt{0,04}.\sqrt{0,81}-\sqrt{0,16}$

işleminin sonucu kaçtır?

Aşağıda çözümü verilen problemin hangi basamağında hata yapılmıştır?

Çözüm :

I . adım: $0,8+0,2.0,9-0,4$

II. adım: $1.0,9-0,4$

III. adım: $0,9-0,4=0,5$

A) Problem doğru çözülmüştür.

B) İlk hata I. adımda yapılmıştır.

C) İlk hata II. adımda yapılmıştır.

D) İlk hata III. adımda yapılmıştır.

10) $\sqrt{18}-\frac{6}{\sqrt{2}}+3\sqrt{\frac{2}{9}}$ işleminin sonucu nedir?

A) $5\sqrt{2}$ B) $\frac{2\sqrt{2}}{3}$ C) $\sqrt{2}$ D) $-\sqrt{2}$

11) $\sqrt{36}+\sqrt{(-4)^2}-\sqrt{3^2}$ işleminin sonucu kaçtır?

A) -1 B) 3 C) 6 D) 7

12) $\sqrt{2+\frac{1}{4}}-\sqrt{2,25}$ işleminin sonucu kaçtır?

A) -1 B) 0 C) 1 D) 2

13) Bir zarın yüzeylerinde $\sqrt{2},\sqrt{3},\sqrt{5},\sqrt{6},\sqrt{7}$ ve $\sqrt{8}$ köklü sayıları bulunmaktadır. Dört kişi aşağıda belirtilen atışları yapıyorlar. Toplamı en büyük olan yarışı kazanacağına göre; yarışı kim kazanmıştır?

I. kişi : $\sqrt{2}$ ve $\sqrt{8}$

II. kişi : $\sqrt{3}$ ve $\sqrt{3}$

III. kişi : $\sqrt{5}$ ve $\sqrt{5}$

IV. kişi : $\sqrt{2}$ ve $\sqrt{5}$

A) IV. B) III. C) II. D) I.

14) $\frac{\sqrt{18}.\sqrt{12}}{\sqrt{3}.\sqrt{6}}\cdot\frac{1}{\sqrt{2}}$ işleminin sonucu kaçtır?

A) $\sqrt{2}$ B) $\sqrt{3}$ C) $\sqrt{6}$ D) $\sqrt{8}$

15) $\frac{\sqrt{48}+\sqrt{75}}{\sqrt{27}-\sqrt{12}}$ işleminin sonucu kaçtır?

A) -3 B) 1 C) 7 D) 9

16) Aşağıdakilerden hangisi doğrudur?

A) $4\sqrt{3}+3\sqrt{5}=7\sqrt{8}$

B) $\sqrt{24}+\sqrt{54}=5\sqrt{6}$

C) $\sqrt{0,4}+\sqrt{0,9}=\frac{1}{2}$

D) $2\sqrt{5}.5\sqrt{4}=\sqrt{200}$

17) $\sqrt{1369}$ sayısının karekökü aşağıdakilerden hangisidir?

A) 37 B) 33 C) 27 D) 23

18) $a=\sqrt{2}$, $b=\sqrt{5}$ olduğuna göre $\sqrt{50}$ sayısının a ve b cinsinden değeri aşağıdakilerden hangisidir?

A) $a.b$ B) $a^2.b$ C) $a.b^2$ D) $a^2.b^2$

19) $\frac{\sqrt{0,49}+\sqrt{0,16}+\sqrt{0,25}}{\sqrt{0,01}}$ işleminin sonucu için aşağıdakilerden hagisi söylenebilir?

A) Negatif sayıdır. B) Asal sayıdır.
C) Çift sayıdır. D) Pozitif tek sayıdır.

HARFLİ İFADELER ÇARPANLARA AYIRMA

1) $\frac{x^4+x^4+x^4}{x^2.x^2.x^2}$ ifadesinin eşiti nedir?

A) 1 B) $\frac{1}{3}x^2$ C) x^{-6} D) 3. x^{-2}

2) $(2a-3b)^5$ açılımında a^3b^2 li terimin katsayısı kaçtır?

A) 650 B) 720 C) 810 D) 930

3) $\frac{x^2y+xy^2}{(x^2+2xy+y^2).xy}$ ifadesinin sadeleşmiş şekli aşağıdakilerden hangisidir?

A) $\frac{1}{x+y}$ B) x + y C) x . y D) x

4) $x^2+y^2=61$, $x+y=11$ ise $x\cdot y$ kaçtır?

A) 23 B) 25 C) 28 D) 30

5) a – b = 12 ve $\frac{1}{a}-\frac{1}{b}=4$ ise a . b kaçtır?

A) –3 B) –2 C) 2 D) 3

6) $\frac{a^2-ab-a+b}{a-1}$ ifadesinin sadeleşmiş biçimi aşağıdakilerden hangisidir?

A) a – b B) b – a
C) a + b D) –(a+ b)

7) $a+b=\frac{8}{\sqrt{3}}$ ve $a-b=\frac{\sqrt{3}}{4}$ ise a^2-b^2 ifadesi aşağıdakilerden hangisine esittir?

A) $\sqrt{2}$ B) 2 C) $2\sqrt{2}$ D) 4

8) $2x^3 - x^2 + 5x$ ifadesinin x = –1 için değeri kaçtır?

A) –8 B) –6 C) 6 D) 8

9) $\frac{(x-y).(x^2+xy+y^2)}{(x+y)^2-xy}$ ifadesinin sadeleştirilmiş şekli aşağıdakilerden hangisidir?

A) x – y B) y – x
C) $x^2 – y^2$ D) $x^2 + y^2$

10) Aşağıdaki ifadelerden hangileri doğrudur?

I. a = 2003 için $\left(a-\frac{1}{a}\right):\left(1-\frac{1}{a}\right)=2004$ tür.

II. $a+\frac{1}{a}=6$ için $a^2+\frac{1}{a^2}=34$ tür.

III. a – b = 4 ve ab = 2 ise $a^2 + b^2 = 20$

A) Yalnız I B) I ve II
C) II ve III D) I, II ve III

11) $\frac{x^2+ax+6}{x+2}$ ifadesi sadeleşebilir bir kesir olduğuna göre a aşağıdakilerden hangisidir?

A) -5 B) -3 C) 3 D) 5

12) $2x^3 – x . (x^2 + 1)+x$ ifadesinin eşiti nedir?

A) $2x^2$ B) x^3 C) $2x^3$ D) 3x

13) $(a+2)^3$ ifadesinin açılımında katsayılar toplamı kaçtır?

A) 8 B) 24 C) 27 D) 28

14) $x^2 - y^2 = 12$, $x + y = 6$ ise $x - y$ kaçtır?

A) 1 B) 2 C) 3 D) 4

15) $\dfrac{a^2+1}{a^4-1} \div \dfrac{a-1}{a^2-1}$

ifadesini sadeleştiren bir öğrenci aşağıdaki işlemleri yapmıştır.

Bu öğrenci hangi adımda hata yapmıştır?

I. adım: $\dfrac{a^2+1}{(a^2+1).(a^2-1)} : \dfrac{a-1}{(a+1).(a-1)}$

II. adım: $\dfrac{1}{a^2-1} : \dfrac{1}{a+1}$

III. adım: $\dfrac{a+1}{a^2-1}$

IV. adım: $\dfrac{a+1}{(a+1).(a+1)} = \dfrac{1}{a+1}$

A) I B) II C) III D) IV

16) $a^8 - b^8$ ifadesinin çarpanlarından biri aşağıdakilerden hangisi **değildir**?

A) $a^4 + b^4$ B) $a^2 + b^2$

C) $a - b$ D) $a^2 + 4b^2$

17) $\dfrac{x^2-x-2}{2x-4} \div \dfrac{x^2-1}{4x^2-4x}$ işleminin sadeleşmiş biçimi aşağıdakilerden hangisidir?

A) $\dfrac{4}{x}$ B) $4x$ C) $\dfrac{2}{x}$ D) $2x$

18) $\dfrac{76^2-15^2}{31^2-30^2}$ işleminin sonucu kaçtır?

A) 91 B) 76 C) 30 D) 15

19) $\dfrac{b^2-2ab}{a^2+b(b-a)} \div \dfrac{2a-b}{a^2-ab+b^2}$ ifadesini sadeleştirirken işlemler aşağıda yapılmıştır.

Buna göre hangi adımda hata yapılmıştır?

I. adım: $\dfrac{b(b-2a)}{a^2+b(b-a)} \cdot \dfrac{a^2-ab+b^2}{2a-b}$

II. adım: $\dfrac{b(b-2a)}{a^2+b^2-ab} \cdot \dfrac{a^2-ab+b^2}{2a-b}$

III. adım: $\dfrac{b(b-2a)}{1} \cdot \dfrac{1}{2a-b}$

IV. adım: b

A) I B) II C) III D) IV

20) $a + \dfrac{1}{a} = 3$ ise $a^2 + \dfrac{1}{a^2}$ kaçtır?

A) 7 B) 9 C) 11 D) 17

I. DERECEDEN DENKLEMLER VE BİR BİLİNMEYENLİ PROBLEMLER

1) $\frac{1-x}{2}-\frac{3-x}{4}-\frac{5-x}{6}=1$ eşitliğini saglayan x kaçtır?

A) –25 B) -13 C) -7 D) -3

2) $(x-1)\cdot(3x-2)=(x-1)\cdot 3x$ denkleminin çözüm kümesi aşağıdakilerden hangisidir?

A) $\{1,2\}$ B) $\{1\}$

C) $\{2\}$ D) $\{0,1\}$

3) $\frac{2}{x}+\frac{3}{y}=12$ $\frac{1}{x}+\frac{1}{y}=3$ denklem sisteminin çözüm kümesi aşağıdakilerden hangisidir?

A) $\left\{\left(-\frac{1}{3},\frac{1}{6}\right)\right\}$ B) $\left\{\left(-\frac{1}{3},\frac{9}{5}\right)\right\}$

C) $\left\{\left(\frac{1}{9},-\frac{1}{3}\right)\right\}$ D) $\left\{\left(\frac{9}{5},-\frac{1}{3}\right)\right\}$

4) $\frac{x+a}{2}-\frac{x+a-2}{3}=x-\frac{9}{4}$ denkleminin kökü olan x "7" ise a kaçtır?

A) -27 B) -24 C) -21 D) -14

5) Tabloda verilen toplama işlemine göre , aşağıdakilerden hangisinin değeri bulunabilir?

+	x	y
x		2
z	5	

A) y+z B) x-y

C) y-z D) x-z

6) $2a+b=6$ $b-a=3$ denklem sistemi için aşagıdakilerden hangisi doğrudur?

A) a ile b eşittir.
B) a , b nin 3 katına eşittir.
C) a , b nin 2 katına eşittir.
D) b , a nın 4 katına eşittir.

7) $\frac{4}{x-3}-\frac{x+4}{x+3}+\frac{x^2}{x^2-9}=0$ denklemini saglayan x kaçtır?

A) -2 B) -4 C)-8 D) -10

8) Bir sayının 5 katı ile kendisinin toplamı, aynı sayının 3 katından 132 fazla olduğuna göre bu sayının yarısı kaçtır?

A) 17 B) 18 C) 21 D) 22

9) $2(x+y)+3(y-x)=54$

$9x+2(x+y)=90$ denklem sisteminin çözüm kümesi aşağıdakilerden hangisidir?

A) $\{(3,4)\}$ B) $\{(6,12)\}$

C) $\{(8,10)\}$ D) $\{(9,15)\}$

10) "Bir çiftçi kilogramı 4 YTL den 50 kg buğday satmıştır. Eline geçen paranın 140 YTL si ile kumaş kalanı ile de atına yem almıştır. Atına aldığı yemin bir kilogramı kaç YTL dir?"

Bu problemin çözülebilmesi için, aşağıdaki bilgilerden hangisinin verilmesi gerekir?

A) Kaç metre kumaş alındığı

B) Buğdaydan kaç lira kazandığı

C) Atına kaç kilogram yem aldığı

D) Atın yemine kaç YTL verdiği

11) Bir annenin yaşı, üç çocuğunun yaşları toplamının 2 katından 1 eksiktir. 2 yıl önce annenin yaşı cocuklarının yaşları toplamının 3 katı olduğuna göre anne bugün kaç yaşındadır?

A) 31 B) 30 C) 29 D) 28

12) Osman bugün 51 yaşındadır. Osman' ın n yıl sonraki yaşı, n yıl önceki yaşının 2 katıdır. Buna göre, n kaçtır?

A) 14 B) 17 C) 20 D) 25

13) İki sayının toplamı 72 dir. Küçük sayının $\frac{1}{5}$ i ile büyük sayının $\frac{1}{6}$ sının toplamı 13 olduğuna göre, büyük sayı kaçtır?

A) 36 B) 42 C) 48 D)54

14) "Bir otomobil belli bir uzaklığı 10 saatte alıyor. Eğer saatte 40 km daha hızlı gitseydi aynı yolu 6 saatte gidecekti Aracın ilk hızı saatte kaç kilometredir?"

Problemin çözümünü veren denklem aşağıdakilerden hangisidir?

A) $\left(\frac{x}{10}+40\right)\cdot 6=x$

B) $(x+40)\cdot 6=10x$

C) $\left(\frac{x}{6}-40\right)\cdot 10=x$

D) $10\cdot(x-40)\cdot 10=6x$

15) $\frac{1}{6}$ sının 6 fazlasının $\frac{1}{6}$ sı 4 olan sayının rakamları toplamı kaçtır?

A) 6 B) 7 C) 8 D) 9

16) Bir tankın içinde bir miktar benzin vardır. Tanka 20 litre benzin ilave edilirse tankın $\frac{2}{3}$ 'si doluyor. Tanktan 10 litre benzin boşaltılırsa tankın $\frac{1}{4}$'i dolu oluyor. Buna göre tankın tamamı kaç litre benzin alır

A) 64 B) 72 C) 84 D) 96

17) %10 u şeker olan 600 gram şeker su karışımının 200 gramı alınıp yerine 100 gram su eklendiğinde yeni karışımın şeker oranı yüzde kaç olur?

A) 10 B) 9 C) 8 D) 6

18) Tuz oranı %40 olan 150 gram tuzlu su ile tuz oranı %60 olan 50 gram tuzlu su karıştırılıyor. Buna göre, aşağıdakilerden kaç tanesi doğrudur?

I. Yeni karışımın tuz oranı %45 tir.

II. Yeni karışımdaki tuz miktarı 90 gramdır.

III. Yeni karışımdaki su miktarı 110 gramdır.

IV. Yeni karışımın su oranı %65 tir.

A) 4 B) 3 C) 2 D) 1

19) $\frac{4}{x+1}-\frac{3}{x^2-x}+\frac{8}{x^2-1}=\frac{4(x^2-1)}{x(x+1)(x-1)}$ denkleminin çözüm kümesi aşağıdakilerden hangisidir?

A) $\{1,2\}$ B) $\{-1\}$

C) $\{\ \}$ D) $\{0,1\}$

20) $3x-2-4x+3=\frac{1}{3}x-2$ denklemini saglayan x kaçtır?

A) $\frac{7}{4}$ B) 2 C) $\frac{9}{4}$ D) 3