

Undergraduate Students' Attitude towards Mathematics after Peer Teaching Experience

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Abstract

This study examines the undergraduate students' attitude towards mathematics after peer teaching experience. The participants consisted of (32) undergraduate female students. The study used the Pretest-Posttest Control-experimental group design using two groups of undergraduate female students. Both groups studied the same textbook, solved the same worksheets, and were taught by the same instructor. In order to gather data, the researchers prepared the Mathematics Attitude Test (MAT) which was administrated to both groups before and after the treatment. Data analysis were carried out by using means, standard deviations, and Analysis of t-test. The study showed that there was a statistically significant difference at $\alpha = 0.05$ (α in the attitude towards mathematics attributed to the peer teaching strategy).

Keywords: Mathematics, Peer Teaching, Attitude, undergraduate

1. Introduction

Nobody denies the importance of mathematics. Students start learning mathematics from grade one or even before because educators, parents, and students believe that studying mathematics is essential for understanding the world around us.

The low achievement of mathematics in school level or university level has increasingly become a disturbing phenomenon that needs to be urgently addressed. From students' point of view, mathematics is very difficult and because of that they

dislike it. Some students reverse the cause-effect process and claim that because the students dislike mathematics, they find it difficult.

Attitude towards mathematics plays a vital role in mathematics education. Educators always emphasize on having a good learning environment in the class to improve the attitude of the students, an environment which helps students to learn, study, and interact with the curriculum and the instructor as well.

Learning is not a simple process. It consists of many domains or dimensions including psychological dimension, cognitive dimension, and social dimension. Although all the dimensions are important, the social dimension has emerged as a basic player in any learning activity for students of any age. Students together accomplish more than individuals which assure the great benefit of group work or cooperative learning strategy, which becomes one of the most efficient strategies that can create a math-friendly environment.

Anderson (2005) reported that students in cooperative learning environment scored higher than their peers in standardized testing of the curriculum and were more positive about their learning experience

Whicker, Bol, and Nunnery (1997) studied thirty-one (31) high school juniors and seniors. They found that most students indicated that they liked working in groups and getting help from other students.

Lord (2001) reported that students working in groups perform better on exams, especially on questions that involve reasoning and critical thinking skills. Actually, peer teaching, a type of collaborative learning, often happens spontaneously with a group of students. In fact, educators have found through experience and their research that peer teaching is an effective strategy in helping learners achieving the educational goals.

Students learn a great deal by explaining their ideas to others and by participating in activities in which they can learn from their peers. They develop skills in organizing and planning learning activities, working collaboratively with others, giving and receiving feedback and evaluating their own learning.

Peer tutoring is the process between two or more students in a group where one of the students acts as a tutor for the other group-mate(s). Peer tutoring can be applied among students of the same age or students belonging to different age groups.

Al Deeb (2006) states that peer teaching is one of the most effective strategies in the teaching and learning process because it deals with the social as well as the academic side of learning by creating a comfortable environment for teaching and learning.

Topping (1998) defined peer tutoring as taking on a specific role: Someone has the job of tutor while the other(s) is (are) in the role of tutee(s).

Since the roles of peer teachers vary, the terms 'peer teaching,' 'peer coaching,' and 'peer tutoring' are virtually interchangeable. Advanced students or upperclassmen often serve as tutors for less academically prepared tutees (who often are also underclassmen).

Although the name 'peer teaching' sounds straightforward, it is, in fact, a complex process by which a student learns from another student who has more experience and knowledge. Afaneh (2007) considered peer teaching to be communication between an

excellent student, who is doing very well or who recently completed the course successfully, and another student encountering difficulties in the same course.

1.1 Statement of the Problem:

The Unit of Mathematics and Sciences in Dhofar University offers many courses for students of arts, engineering, and business and commerce. One course has always had a large numbers of failures and the mean of all sections is consistently weak. The students who enroll in this course are usually from arts and business students.

How to decrease the number of failures in this course was the major concern of the mathematics professors. Trying to understand the problem, the researchers and the professors interviewed many students to discuss the low score in mathematics. The most repeated answers were:” I don’t like mathematics” and “I’m not good at mathematics”.

Obviously, most of the failures have a negative attitude towards mathematics and this seems to be one of the most important reasons for the bad performance in mathematics. Many ideas and suggestions were discussed in order to help the students to improve their attitude towards mathematics.

One of the strategies discussed was peer teaching strategy. This strategy is an inexpensive and useful. Many researchers reported that peer teaching is increasingly popular in higher education and it facilitates both cognitive and social gains of the students.

Based on comments of Learning Support Center (LSC) of the university, some weak students (not all students) improve their achievement if they get assistance from their peers. The mathematics professors adopted the idea. The big question was about the category of the students who may benefit from the peer teaching strategy.

Failures were divided into three categories. The first category included students who scored 0-20% on the midterm exam. The second category included students who scored 20-40 % on the midterm exam and the third category included students who scored 40-60% where the passing percent is 60%. The professors, Learning Support Center (LSC) director, and the researchers agreed that the category with the most potential for benefits from the peer teaching strategy was the third category (40-60%) because the students from other categories need special remedial programs addressing the severe weakness of mathematical skills which was clear in the answer of the exam script. The desired benefit of peer teaching strategy includes decreasing the number of failures and improving the attitude of the students towards mathematics.

While the concern of the mathematics professors and Learning Support Center (LSC) director was improving the mathematics achievement and decreasing the number of failures, the major concern of the researchers was studying the effect of the peer teaching strategy on the attitude towards mathematics.

1.2 Research Question:

What is the effect of peer teaching on the attitude towards mathematics of the undergraduate students in Oman?

1.3 Research Hypothesis

There is no statistically significant difference at ($\alpha = 0.05$) in the attitude towards mathematics of the undergraduate students in Oman attributed to the peer teaching process.

1.4 Significance of the Study:

This study aimed to find out the significance of using advanced students to help college teachers in teaching mathematics. When using the traditional way of lecturing in math, physics, or any scientific course, the students are nothing but passive participants in the learning process.

When the number of students in any class is large, the teacher cannot pay enough attention to all students in the class so he needs help or support. This study added important information to educators about enhancing the teaching process by using the inexpensive strategy of peer teaching.

This study contributed considerably to the psychological and educational research in the field of the pedagogy of college mathematics. If the outcome shows that peer teaching is an effective way to assist math teachers, it will encourage faculty to take advantage of the mutual benefits that occur when students teach others.

1.5 Scope and Delimitations of the Study

The generalization of the findings is limited by:

1. A sample of undergraduate female students in Dhofar University.
2. Two chapters of Mathematics textbook of "Applied Mathematics for Business, Economics, and Social Sciences".
3. The validity and reliability of instruments of the study.

1.6 Operational Definitions:

Two main terms involved in the study: Peer Teaching and Attitude towards mathematics.

Peer Teaching: A strategy by which student teaches other students that are weak and less experienced about a certain subject.

Attitude towards mathematics: It is the favorable or unfavorable response to things, places, people, events or ideas (Koballa, 1995) and it will be measured by student score in Mathematics Attitude Test (MAT) that was prepared by the researchers.

2. Theoretical Literature and Related Studies

2.1 Theoretical Literature:

Social learning theories claim that people learn in social contexts (learn from each other). Lev Vygotsky (1962), a psychologist, first reported that we learn through our interactions and communications with others. Many other educational theorists adopted Vygotsky's social process ideas and proposed strategies that foster deeper knowledge construction, and build active learning communities through small group based instruction.

Christison (1990) considered cooperative learning as a good strategy to increase the attention and motivation of the student. Oslen and Kagan (1992) reported cooperative learning as an activity, which depends on the social interaction and exchange of information between students working in groups, and each student is accountable for his own learning.

Actually, peer interaction can have a great impact on academic achievement and motivation as well (Light & Littleton, 1999; Steinburg, Dornbusch, & Brown, 1992; Wentzel, 1999). Many researches showed that the socialization process, which takes place during the peer teaching, is useful and helpful for both, tutor and tutee. It increases the motivation of the students to learn and in the same time the social standing among peers will be much better (Fuchs, D., Fuchs, L.S., Mathes & Martinez, 2002; Rohrbeck et. al, 2003; Miller & Miller, 1995)

Peer teaching is a very old practice. A simple model of peer teaching consists of more qualified students help less qualified students in a small groups environment. As peer tutoring researches have advanced and proceeded, defining it has become more difficult.

Atieh (1999) reported that the term “peer teaching” is a system in which students cooperate with each other to learn. One of them (peer teacher) delivers cognitive knowledge to other students (peer learner) under the guidance of the teacher. Darwaza (2000) defined peer teaching is an interactive strategy consists of two parts. The first part plays the role of the teacher and the other plays the role of the learner.

Boud et al., (1999) defined peer tutoring as 'use of teaching and learning strategies in which students learn with and from each other without the immediate intervention of a teacher'

Saif (2004) highlighted the importance of the teacher supervision in any peer teaching process. This is very important to address any problem arises or handle any difficulty may take place.

Peer tutoring is a term that describes different modules of tutoring arrangements. It refers to students working in pairs to help one another learning a certain task. Peer tutoring works best when students of different ability levels work together (Kunsch, Jitendra, & Sood, 2007).

Researches show that peer teaching has many benefits for students. Academic benefits, psychological benefits, and social benefits. Peer teaching increases the academic achievement, enhances the relationships with peers, supports personal and social development as well as increases motivation. (Topping, 2008).

Peer teaching can be applied in different approaches. Abu Shaban (2010) identified different types of peer teaching:

1. Discussion groups: small groups guided by student teaching assistant. The groups are used to supplement large lectures. The student teaching assistant is selected among students who previously have done well in the course.
2. One-to-one tutoring: One skillful student (peer teacher) and one student (peer learner) who is weak or less skillful.
3. Student Learning Groups – In which students learn and work in self-guided groups to enhance peer learning.

The researchers will follow the first approach in this study. There will be a student teaching assistant who previously studied the course and scored >95 %.

2.2 Previous related studies:

Hulya (2004) conducted a study aimed to explore the effectiveness of one of the interactive engage method, which is peer instruction enriched by concept test on students' achievement and attitude towards physics. He used two types of teaching: peer instruction enriched by concept test and traditional instruction. Multivariate Analysis of Covariance (MANCOVA) is used to analyze the data of the post-test. The statistical results indicated that peer instruction was more effective than traditional instruction. However, the study showed no differences in attitudes towards physics between the two groups

Imam Gholivand (2015) conducted a study in which she compared between the Affection of Peer tutoring on the Attitude toward Mathematical, Physics and English languages lesson. Random sampling method was used. The sample was consisted of (73) students selected from statistical society, and were put randomly into three (3) groups. Aiken's Questionnaire (pre-test) was used. The results showed that peer tutoring method has had a Significant positive affected on the General attitude of Mathematical, Physics and English language.

Mirzeoglu (2014) conducted a study aimed to examine the effect of peer teaching on the university students' achievement in cognitive, affective, psychomotor domains and game performance in volleyball courses. A quasi-experimental design was used in this study. The sample of the study composed of 24 females and 46 males. Volleyball achievement test, volleyball attitude scale, and volleyball skills observation forms have been used to collect data. The results of the study showed that using different instructional models improve students' achievement in cognitive, psychomotor domains and game performance.

3. Methodology

This chapter discusses the participants of the study, the instrument used to gather data and also validity and reliability of the instrument, different kind of design and why the study adopted the current design, and how statistical treatments were carried out.

3.1 The study sample:

The sample of the study is all the students (males and females) who enrolled in the course "Mathematics for The Arts" in spring semester 2014-2015. The researchers tried to find a peer tutor accepts to deal with all students (boys or girls) but failed. The male peer student refused to work with female students and the female peer tutor refused to work with male students. This situation can be justified if we understand the nature of people in Dhofar region. The local community of Dhofar region consists mainly of tribes and clans who do not allow boys and girls to communicate with each other. Even in the classroom, the boys usually take one side of the hall and the girls take the other side with no mixing at all. However, because the number of girls in the

university is greater than the number of boys, the researchers decided to apply the study to girls only.

There are two main restrictions in this study:

- * The sample consists of female students only (No male students).
- * The study concentrates on the failures students who scored in the first mid-term exam between 40%-60%.

To maximize the number of participants, we selected the instructor who had the largest number of sections. Four sections taught by the same instructor were selected. The average number of each section was thirty (30) students. The total number was 120 students. The result of the first exam showed that the percent of the failures was around 46% or 55 students. The number of female failures which belonged to our category (8-12) were (32) students.

The study sample composed of (32) undergraduate female students enrolled in a course, "Mathematics for Social Sciences I" in spring 2014-2015 semester in Dhofar University. All students belong to the third category who scored in the midterm exam between (8-12). Taking into account that midterm exam is out of 20.

3.2 Study Instrument:

To investigate the attitudes towards mathematics, it is appropriate to consider a 'mixed methods' approach that combines a quantitative method (Mathematics Attitude test MAT) and a qualitative method (interview).

Mathematics Attitude test (MAT).

Attitude towards mathematics is very important and sometimes dominant in Mathematics Education. After reviewing the literature, the researchers developed the Mathematics Attitude Test (MAT). This test-in its final draft-composed mainly of four dimensions (Subscales) and thirty items. The four dimensions are (Tapia& Marsh II, 2004; Majeed, Darmawan, & Lynch, 2013):

1. Self-confidence: He/she is good or bad in Mathematics.
2. Value: Mathematics is useful or not.
3. Enjoyment: Likes or dislikes mathematics
4. Motivation: Tendency to participate or refuse mathematical activities.

There are six items in self-confidence subscale, six items in Value subscale, nine items in Enjoyment subscale, and nine items in Motivation subscale.

The test is 5 points Likert Scale. For each item there are five responses: Strongly Agree, Agree, Neither, Disagree, and Strongly Disagree. For positive responses, the weight of "Strongly Agree" =5 and the weight of "Strongly Disagree" =1. The sort is reversed for negative responses.

In order to check the validity, the test was sent to a professor in mathematics, a professor in mathematics education, and a professor in educational psychology. The comments and the suggestions of the professors were discussed and changes had been made. The degree of agreement of the test was calculated based on Cooper equation

and was found (86%). Darwaza (1997) accepted the coefficients if it is greater than (75%).

To calculate the reliability of the test, the researchers used Cronbach's alpha method after analyzing the responses of fifteen students. The coefficient of Cronbach's alpha was (0.79).

After administrating the Mathematics Attitude Test (MAT) to both groups, the students had been interviewed by the researchers to validate the results of the test. Every student was asked to answer the following questions:

- Do you like or dislike mathematics? Why?
- In your opinion, Is mathematics important in our daily life or not? Why?

3.3 Study Design and Variables:

3.3.1 Independent variable: Peer Teaching Method.

3.3.2 Dependent variable :Attitude towards Mathematics

3.4 Research Design:

It was planned from the beginning to use the factorial design ($CRF_{2 \times 2}$) with two treatments: peer teaching and gender. However, because peer tutors did not want to deal with other gender; the study used the Pretest-Posttest Control-experimental group design using two groups of Dhofar University female students. The first group was taught with peer teaching strategy while the other group was taught without peer teaching strategy.

The peer tutor was attending the classes of the experimental group students (three hours per week). She was teaching, explaining, and leading her students in problem-solving activities. The groups consisted of four students. The tutor was officially hired and she was paid a payment of (8.0 RO) per hour (taking into account that this course is usually presented by lectures and no tutorials). The language of teaching and tutoring was English. The time for the teaching-learning process offered to the students in both groups was the same. In the experimental group, the peer tutor guided the students while the instructor himself led the students in the control group.

Study Design:

G1	X1	O1	O2
G2		O1	O2

G1: a group which was taught by peer teaching.

G2: group which wasn't taught by peer teaching

X₁: Experimental manipulation of the 1st group

O₁: Pre-test performance of students on Mathematics Attitude Test (MAT).

O₂: post-test performance of students on Mathematics Attitude Test (MAT).

3.5 Statistical Treatment:

In order to analyze the data, the researchers used means, standard deviations, and t-test

3.5 Procedure

The following procedures were followed:

- Administrating the first midterm and choosing all the female students who scored between 8-12 (out of 20).
- Meeting with the girls, explaining the aim of the study, the nature of their participation, and getting their consent for participation in the study.
- Assigning the girls randomly into experimental and control groups based on the results of the first mid-term.
- Administrating the pre-test of Mathematics Attitude Test (MAT).
- Starting the treatment which continues until the end of the semester.
- Administrating the post-test of Mathematics Attitude Test (MAT) at the end of the semester.

4. Results

The researchers administrated the mid-term exam, selected the groups, and checked the equivalency of the groups regarding achievement. After that the pre-test of Mathematics Attitude Test (MAT) was administrated and the equivalency of the two groups regarding attitude towards mathematics had been checked also.

4.1 Administrating the first mid-term and choosing the participants of the sample:

The midterm exam was used to select the sample of the study. Table (1) shows the mean and standard deviation of the mid-term exam. Referring to the table (1) the mean score of the experimental group is (10.34) while that of the control group is (10.16) out of a maximum possible score of (20).

To check if the difference in the means of the pre-test is statistically significant or not, an analysis of t-test has been associated. Table (2) explains the results.

Table (2) shows that “there is no significant difference in the means of experimental group (M=10.34, SD=1.33) and the control group (M=10.16, SD=1.21) of the mid-term test; $t(30) = 0.209$, $p = 0.836$ ”. Based on the results of the analysis the researchers considered the two groups equivalent with respect to the achievement of the mid-term exam.

Table (1): The means and standard deviations for the results of the first mid-term

	Group	N	Mean	Std. Deviation
First midterm	Experimental	16	10.34	1.33
	Control	16	10.16	1.21

Table (2): t-test Result Comparing Experimental and Control Groups on First mid-term before Treatment.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Upper	Lower
First mid-term	Equal variances assumed	.138	.713	.209	30	.836	.09375	.44888	-.82299	1.01049
	Equal variances not assumed			.209	29.726	.836	.09375	.44888	-.82335	1.01085

4.2 pre-test of Mathematics Attitude Test (MAT)

After assigning the groups, the researchers and the instructor of the course administrated the pre-test of Mathematics Attitude Test (MAT). The analysis of the scores of the pre-test including the students' mean and standard deviation were shown in Table 3. For the experimental group, the mean = (91.1250), while for control group the mean = (93.6875) out of 150.

To check if the difference in the means of pre-test is statistically significant, t-test has been used. Table (4) shows the results.

Table (4) shows that "there is no significant difference in the means of the experimental group (M=91.1, SD=8.3) and the control group (M=93.7, SD=6.1) of the pre-test; $t(30) = 0.991$, $p = 0.330$ ". Based on this analysis the two groups (The experimental group and control group) are also considered equivalent with respect to attitude towards Mathematics.

Table (3): pre-test analysis for Experimental and Control groups

	Group	N	Mean	Std. Deviation
Attitude	Experimental	16	91.1250	8.34166
	Control	16	93.6875	6.11794

Table (4): t-test analysis of (MAT) before treatment.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
Attitude	Equal variances assumed	.886	.354	-.991	30	.330	-2.56250	2.58617	-7.84417	2.71917
	Equal variances not assumed			-.991	27.51	.330	-2.56250	2.58617	-7.86423	2.73923

4.3 Post-test

The main question of this study is: What is the effect of peer teaching on the attitude towards mathematics of the undergraduate students in Oman? The following hypothesis emerged from this question:

There is no statistically significant difference at ($\alpha = 0.05$) in the attitude towards mathematics of the undergraduate students in Oman attributed to the peer teaching process.

To answer this question, the means and standard deviations of the post-test of (MAT) was obtained and explained in the table (5) below. The mean score on the post-test for the experimental group was found to be (105.3125) while that of the control group was found to be (89.8125) out of a maximum possible score of 150.

To find out whether the difference of the Attitude towards mathematics in the post-test is statistically significant, an analysis of t-test has been associated. Table (6) shows the results of this analysis.

Table (6) shows that "there is a significant difference in the means of experimental group ($M=105.3$, $SD=9.3$) and the control group ($M=89.8$, $SD=13.2$) of the post-test; $t(30)=3.8$, $p=0.001$ "

Based on this analysis the null hypothesis is rejected and accepting the alternative hypothesis, which states that There is statistically significant difference at ($\alpha = 0.05$) in the attitude towards mathematics of the undergraduate students in Oman attributed to the peer teaching process.

Table (5): post-test analysis for Experimental and Control groups

	Group	N	Mean	Std. Deviation
Attitude	Experimental	16	105.3125	9.26440
	Control	16	89.8125	13.19201

Table (6): t-test analysis after treatment

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
Attitude	Equal variances assumed	1.598	.216	3.846	30	.001	15.50000	4.03003	7.26958	23.7
	Equal variances not assumed			3.846	26.901	.001	15.50000	4.03003	7.22964	23.7

5. Discussion and Recommendation

The main question of this study is: What is the effect of peer teaching on ($\alpha = 0.05$) the attitude towards mathematics of the undergraduate students in Oman?

The following hypothesis emerged from this question:

There is no statistically significant difference at in the attitude towards mathematics of the undergraduate students in Oman attributed to the peer teaching process.

The results in Table (6) showed that there is a statistical significance difference at a level ($\alpha = 0.05$) in attitude towards mathematics of the undergraduate students in Oman attributed to the peer teaching process.

The finding of this study indicates that the students after the treatment had a more positive image about mathematics, which reinforces the impact of peer teaching on the attitude. Actually, students who learn through collaboration not only learn better but enjoy learning better because instead of just being passive learners or listeners, they actively participate in the learning process and consider themselves responsible for their own learning. Peer interactions enable the participants to have a clear experience of common interests and efforts, equal distribution of power, trust and honesty. Morteza Karami et al., (2012) reported that discussion in small groups will

lead to monitoring of the students' learning and, therefore, leads to their independence in learning and studying.

Researches show that students prefer to receive feedback from their classmates rather than the teacher. Many students are confused when they are requested to answer or participate in any discussion guided by the teacher. They are scared of being wrong or that answer is not appreciated by the teacher. Ehly and Stephen (1980) Reported that students may feel more at ease when they deal with a peer tutor rather than their teacher or professor, which enable them to study better and concentrate more on the subject matter allowing for better understanding of the concepts.

When sharing the findings of the study with the instructor and checking the results of the students of both groups after the final exam, it was found that the number of failures in the experimental group is less than the number of failures in the control group. There were just three (3) failures from the experimental group which represents (19 %) of the group students. In the other hand, there were five (5) students failed from the control group, which represents (31 %) of the group students.

The researchers asked the peer teacher to report on progress and provide a general description of the performance of the students. The peer teacher said, after around three weeks the girls became active and more serious in dealing with the given materials. "Asking for more practices" is one of the interesting things that were reported by the peer teacher in addition to the positive statements that the girls started using when talking about mathematics.

A question arose about which dimension or (subscale) was more impacted and hence contributed more in improving the score of the students on Mathematics Attitude Test (MAT). An analysis of the result of (MAT) before and after the manipulation of peer teaching was carried out in terms of the four dimensions (subscales):

- Self-confidence: He/she is good or bad in Mathematics.
- Value: Mathematics is useful or not.
- Enjoyment: Likes or dislikes Mathematics
- Motivation: Tendency to participate or refuse mathematical activities.

Table (7) shows this analysis while figure (1) displays the results of the analysis using bar charts:

From the figure (1) and the table (7), it is clear that Motivation (tendency to participate or refuse mathematical activities) was the factor which contributed more to the score of the students on (MAT). This was in full agreement with the observations of the peer teacher. Ryan & Deci (2000) states that Level of engagement influences student motivation to achieve classroom goals. The results of the study were in agreement with Morteza Karami et al., (2012) and Jiménez, Acuña, Quiero, López & Zahn (2015).

When interviewing the students after the study about the peer teaching experience, they were satisfied. They stated that studying with friends is more fun than learning alone. Also, having a peer teacher who hasn't a power over them by virtue of her position or responsibilities was something great and caused the girls to feel relax and comfortable. Some students said that after peer teaching experience they felt that mathematics was not that jungle of mystery. They could solve problems without

scaring from getting a big red “X” that they get from the teacher as a feedback. Slavin (1996) reported that the availability of peer teacher resulted high levels of engagement in any learning process. Moreover, the self-esteem of the student is increasing and the accountability expectations raise the academic achievement.

In the light of the findings, the study recommended to use of peer teaching as an active and inexpensive strategy to help students in improving the attitude towards mathematics.

Table 7: Analysis of (MAT) in terms of the four dimensions before and after the manipulation.

	Before manipulation	After manipulation	Difference %
	Average %	Average %	
self-confidence	50	53.4	3.4
value	65.4	74	8.6
enjoyment	60.7	70.9	10.2
motivation	64.9	78.4	13.5

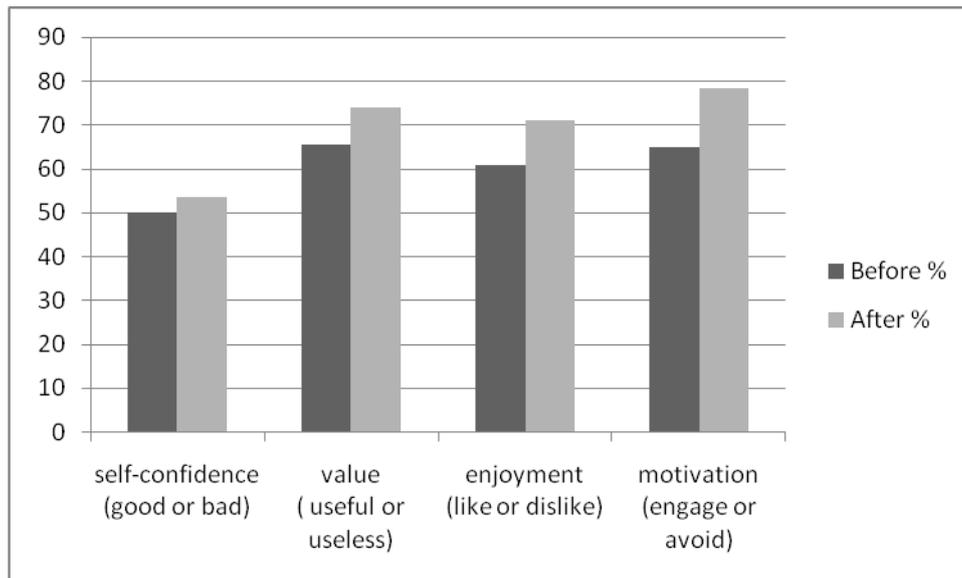


Figure (1): Analysis of (MAT) in terms of the four dimensions before and after the manipulation

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