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Teaching Practices that Develop Positive Attitudes towards Mathematics among Joint First Year Students at the Saudi Electronic University

Abstract

This study seeks to identify attitudes towards mathematics and teaching practices that develop positive attitudes towards mathematics among students of the joint first year at the Saudi Electronic University, from the students' perspective.

The validity and reliability of the instruments were confirmed. The scale of attitudes toward mathematics was applied to (489)

In addition to that, (202) were interviewed to identify the teaching practices that develop positive attitudes towards mathematics.

The study has found that the attitudes of joint first year students towards mathematics was neutral. It also found that all teaching practices included in the interview had a high approval rate by the students. The study recommendations highlighted the importance of professional development for teachers to master these teaching practices and encourage them to utilize them in their teaching.

Keywords: Joint First-Year, Teaching Practices, Attitudes Towards Mathematics, Develop Positive Attitudes, Develop Negative Attitudes.

Introduction

The importance of mathematics cannot be overstated, as it has become an urgent necessity in our contemporary life, due to its several uses and applications. Despite the fact that mathematics is the primary basis for other sciences, and an important tool in facing and keeping pace with what is happening in this era in terms of social, economic, scientific & technical progress. However, it is apparent that many students have trouble in learning mathematics, and many teachers equally experience difficulties reaching these students, who are considered an important element of the educational process.

Low academic achievement is a major problem that faces the students as well as the teachers in the academic level. The student with

low academic achievement may get mark under the normal average and this called the weakness or below the normal level (Al-Zoubi & Younes, 2015). In review of performance of mathematics and reading among 34 countries found the average performance in these countries in mathematics was 22.5% and in reading 18.8% and the low level in these subjects negatively reflects on other subjects due to the fact that achievement in other subjects depends on mastering Mathematics & reading (Petrilli & Scull, 2011). When talking about achievement in mathematics, the matter of attitude towards mathematics comes into mind, due to the great influence of attitude towards mathematics on students' achievement, and the extent of their readiness to learn math and overcome the difficulties and challenges they face when learning it. (Estevez, 2005) found that student's

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attitude towards mathematics affects their achievement and the extent of their acceptance for its concepts and experiences and utilizing it in life. Poor mathematic achievement is very common in the adults this will affect many day to day activities (Geary, 2012). Positive attitude is thought to have positive impact on the mathematical academic achievement and children. The exact mechanism is not known but thought that positive attitude increase the engagement of hippocampal learning memory system (Chen et al., 2018).

A study conducted by (Gorard, 2008) indicated that the negative attitudes of elementary students toward mathematics in Britain were among the most important reasons behind the decline in academic achievement in mathematics. The same results were reached by (Cross Francis, 2008) which aimed to explore the reasons behind the decrease in academic achievement of elementary students in mathematics.

Theoretical/Conceptual Framework

The Concept of Attitude, and the Attitude toward Mathematics Attitude

Attitude serves as rationalization for concealed or unconscious impulses. They are themselves defended by other rationalizations (Maze, 1973).

(Zusho et al., 2005) defines an attitude as "forming a reaction to a certain subject based on its advantages and disadvantages."

The definition of attitude according to (Relich et al., 1994) include the idea that attitude manifest themselves in responding to task, object or situation according to this, Attitude is the neural state of readiness organized through experience exerting dynamic influence on the individual behaviors.

Attitude in general is positive or negative degree of affect associated to certain subject.

Attitude toward mathematics is positive, or negative emotion associated to mathematics this according to (Di Martino & Zan, 2001). The more articulated definition of attitude is the matter that consist of three parts, the emotional phase, the beliefs toward the subject, the final part is the behavior toward the subject and in our case is the three parts associated to the mathematics (Di Martino & Zan, 2001).

There is two dimensional definition of attitude "the behavior doesn't appear explicitly therefore attitude toward mathematics is the pattern of beliefs and emotions toward mathematics (Zan & Di Martino, 2008).

Researchers identified three components of attitude and assess the attitude as ranging from emotions like "I love the mathematics" to those

related beliefs like "mathematics is useful" until the behavior" I always do my homework in math".

- When refer to the emotion its meaning the bad or good feeling when referring to the good thing like feeling pleasure when doing mathematics but anxiety for an example is considered the bad emotion.
- When it refers to the beliefs, the positive attitude is usually meaning sharing by experts.
- Action-based component: which shows how the knowledge-based and emotion-based components react as one's behaviors reflect his/her beliefs and emotions (Di Martino & Zan, 2001).

The Importance of Attitudes

Attitude is very important in our live because it is for an example like the behavior that determine our character. Attitude has a feature that it is the hallmark of the enhancing the accessibility (Fazio.williams, 1989). People frequently consider altitude as very important issue during social expression. There's a good correlation between the attitude and the response latency, usually the response latency increase when the attitude performance is low and the vice versa (Fazio.williams, 1989).

Attitudes have different functions, some of which are mentioned in (Saunders, 2014) They determine behaviors.

- They organize reactions, motivations and knowledge about specific fields.
- They promote one to feel, realize, think, and behave in a certain way.

Generally, attitudes play a huge role in directing one's behavior and help him/her achieve personal and social adaptation. An attitude toward learning is important factor on the learner levels of goal sitting directing students, their beliefs toward learning related to the attitude (Şen, 2013).

The Importance of Studying Attitudes to Teaching Mathematics

There is a very strong relation between the positive attitude and mathematics. Teaching mathematics is usually depend on the positive altitude that taken from the teacher. The beliefs, views and preferences held by the mathematical teachers are very important for student and for developing the mathematical conception in good way. In general the mathematical education is very important because it influence the nation direction and to be one of successful one and this is the main role of mathematics education to

build the positive attitude toward the mathematic education, improve the feeling toward mathematic field (Relich et al., 1994).

- Positive attitudes toward mathematics help increase preferences toward learning mathematics.
- Positive attitudes are essential results of the teaching process.
- There is a positive relation between attitudes toward mathematics and academic achievement most of the time.
- There's a positive relation between attitudes toward mathematics and thinking.
- The attitudes that one develops have a clear role in his/her behavior and, consequently, in his various daily activities.

Studying and measuring attitudes toward mathematics are important also because they serve a lot of educators who are concerned about developing the teaching process; knowing the students' attitudes toward a certain subject and their relation to the students' academic achievement enables teachers to deal with the negative attitudes and work on improving them through changing their teaching techniques and attached activities, and choosing teaching strategies that motivate students. Supervising educating experts in mathematics teaching techniques play a role in guiding teachers to the best teaching strategies so that the students will motivated to study the subject, and help avoid traditional teaching strategies that depend on indoctrination.

Previous Studies

There are many studies focusing on the topic of attitudes towards mathematics in terms of measuring and developing it. (Zan & Di Martino, 2008) focusing on what are the variables that may affect attitude toward mathematics?

In addition, it is possible to change subject's attitude toward mathematics?

They depend on the story of the subjects with mathematics depend on the autobiographic essay and the sample will describe some past fragment and some causal links not in the logical perspective put in social one. The essay proposed to all school levels and the title abbreviated as "me and mathematics". And the amount of essay collected is 1304essay, 741 from the primary school,256 from the middle school,306 from the primary school. the analysis of results depend on the interpretative process and this process may depend on the construction of categories depend on the ground theory and this for instance like or dislike the

mathematics. This result gives some expression the emotional state toward mathematics is usually expresses as like or dislikes mathematics. The perception of being not able to is usually express, as I cannot do it. The vision of mathematics usually describe as mathematic is.....

The student in Philip in in 2003 are considered have a low degree of the subject which need higher order thinking skills. Their attitude toward mathematics is very low and the main influencer that affect the student conception about the mathematical achievement is the teachers as the supporter(Andaya, 2014).

The Malaysian students believe their mathematical attitude is very high but this is not true. In the last few years due to decline in the mathematical attitude. Malaysian eighth graders' mathematic score in TIMSS dropped from 508 points in 2003 through 494 points in 2007 until 451 points in 2011 another study depend on the like of the mathematic.39% of the Malaysian student respond that "very much like learning mathematic" in 2011 compared to 28% in 2015. 16% respond, "They don't like mathematics compared to 15% in the in 2016 and continue to dislike mathematics until recent years (Education, 2018).

In the (Aiken, 1963) study it was found that attitude toward mathematics in females depend on the adjustment of reality while in males depend on the leadership potential. Who achieve high score of different variables they have a high attitude toward mathematics, this study have limitation due to limitation of variables. The sample was 160 females college from female college to study the non-intellective factors influence on females attitude and found that its influence more on the females than males. The study in the form of discussion of the test result trustfully to determine the actually attitude toward mathematics.

(Diana Zamani Norshaieda Adnan, 2010) this study is to determine the criteria that may be considered as important in measuring the attitude toward mathematics. Factor analysis was carried out to identify the group among the criterion. The received respondent was746 in the survey of UITM jahor. The targeted respondent are first semester diploma students taking various program in business related to business studies. The results were that the there are five criterion effect on the attitude toward mathematics and 6 sub criteria for anxiety,5 sub criteria for self-efficacy,3 for outside motivation toward mathematics and 2 for self-concept these are the criteria that may affect the attitude toward mathematics in positive or negative way.

In another study to define the factors that may affect the pattern of attitude to be positive or negative. The sample were the college student

who asked to represent their attitude toward mathematics in all school grades and the study has some limitation which may depend on the memory not all student remember everything that happened in the past. In order to gauge the true fact about their attitude toward mathematics throughout their entire school experience. The author decided that he will choose two different student the first one have steady state decline in attitude toward mathematics and another student has steady state increase in attitude toward mathematics, he made comparison between to students to determine the factors that may affect the pattern of attitude toward mathematics (D'Arcy Wentworth Thompson, 1967).

In the another, study that mention the gender of attitude toward mathematics in relation with achievement in Nigerian secondary school found that the Nigerian students have poor performance in the core subjects like English and mathematics. The low performance will be obstacles in the face of development of the nation. The negative achievement is due to some factors like unqualified staff, poor facilities, lack of equipment and instrument, poor reading habit, crowded classrooms (Amatobi, V. E and Amatobi, 2020).

Some of the previous studies showed interest in studying attitudes of students toward mathematics and exploring the differences that result from some variables. This, as well, is a part of this study's interests, in addition to studying the effect of the heuristic program or some variables in the attitudes of students toward mathematics. It is noticeable that many of those studies focused on one main variable and talked about it broadly in the literature review. Attitudes toward mathematics are secondary variables, and that is shown through the researcher's focus on the main variable in the literature review. This study is unique for its concentration on the attitudes toward mathematics through measuring, improving, and collecting all the different variables that positively affect attitudes toward mathematics according to the students' points of view. All the students who were interviewed to answer the model had a very weak mathematical skills due to the fact that they don't reread the curriculum. If the suggested teaching practices in the model enhance the attitudes of this category of students toward mathematics, then they are more likely to enhance the attitudes of other students to a greater extent.

The Study Problem

During the researcher's work as a faculty at the Saudi Electronic University since it was established in 2012, he noticed a common

weakness in mathematics among students of the joint first year at the University, by analyzing students' grades in the mathematics course at the end of each semester over the past years.

Although there is no consensus among researchers on the existence of a relationship between students' attitudes towards mathematics and their achievement, the enhancement of their positive attitudes towards mathematics is still considered a critical influence on developing the students' mathematical abilities (Fan Lianghuo, Quek Khiok Seng & Yeo Shu Mei, Lionel Pereira-Mendoza, 2019).

Many researchers and educators believe that the most important reason for students' failure in mathematics is their negative attitudes towards mathematics and the various educational manifestations that accompany these trends, such as hatred for mathematics classes, low achievement, and lack of interest in the subject Hussein, (Gilson, 1999). On the other hand, the emphasis on the teacher's role and what they should do is an indication that they are the main focus of students' success in mathematics. Also, the students' success in mathematics depends on the skills, knowledge or practice that the teachers demonstrates (Macmillan/McGraw-Hill, 2007). The results of (Kelly, 2012) study confirmed that teachers were the most influential in students' attitudes towards mathematics. However, attitudes were unstable, but rather variant depending on the teacher's personality. The teacher who engages their students in practical activities, supports their students, and shows their love for mathematics greatly influences their attitudes towards mathematics.

Many research papers have assured the fundamental role of teachers in changing and developing several social and humanitarian fields and have recommended developing it (Sayed, 2016) (Rubagiza et al., 2016) (Siew et al., 2016) (Howel, 2016).

Based on the role that students' attitudes towards mathematics play in their achievement in mathematics, and starting from the great role of the teacher in developing attitudes towards mathematics through the various teaching practices adopted, this study came to identify students attitudes towards mathematics and the teaching practices that lead to the development of positive attitudes towards mathematics among students of the joint first year at the Saudi Electronic University from their point of view, by answering the following two questions:

The Study Questions

First: What are the attitudes of the joint first year students at the Saudi Electronic University towards mathematics?

Second: What are the teaching practices that lead to the development of positive attitudes towards mathematics from students' perspectives?

The Study Objectives

1. Identify the attitudes of the joint first year students at the Saudi Electronic University towards mathematics.
2. Defining the teaching practices that the students of the joint first year at the Saudi Electronic University identified to develop positive attitudes towards mathematics.
3. Increasing awareness of the factors that affect students' achievement in mathematics.
4. Providing recommendations to mathematics teachers and those interested in teaching mathematics, which would contribute to developing positive attitudes towards mathematics among their students and increasing their academic achievement.

The Importance of the Study

The importance of this study stems from the importance of its subject, because identifying students' attitudes towards mathematics and identifying teaching practices that lead to the development of positive attitudes towards mathematics, can reveal some of the reasons that lead to poor mathematics achievement among students, and this leads to suggesting appropriate solutions to address the problem.

Terminology of the Study

1. **The joint first year:** Also known as Common First Year is the first year study of the undergraduate program for all faculties to prepare students psychologically and academically for undergraduate study. Successful completion of the joint first year is a requirement for the student to continue with their university studies.
2. **Attitudes towards mathematics:** mental or neural state of readiness, organized through experience, exerts as a dynamic influence on upon the individuals response toward object or any situation and in our situation is the dynamic influence upon the individual's response to mathematics (Relich et al., 1994).

3. **Teaching practices:** means those behaviors, actions and methods used by teachers in the classroom to present educational material with the aim of achieving learning among students and these teaching practices are inquire by preparing the teacher with high levels of skills to provide similar experience in his classrooms (Haney & Mcarthur, 2002).

The Scope of the Study

1. The geographical limit: The study was conducted on all students at Saudi Electronic University across its all branches in the Kingdom of Saudi Arabia.
2. The time limit: The study was conducted in two phase: The first phase applied the measure of attitudes instrument towards mathematics of students of the joint first year who had studied the mathematics course during the second semester of the academic year 2018-2019, while in the second phase involved interview with the first year students who have taken a mathematics course in the summer semester of the 2019-2020 academic year.
3. Human limit: This study was conducted on students of the joint first year at the Saudi Electronic University.

Methodology and Procedures

Population and Sample of the Study

The study population consisted of all the students of the joint first year at the Saudi Electronic University who studied the mathematics course in the second semester of the academic year 2018-2019 in all branches of the university, the total number was (3298) students.

As for the study sample, the number of students who answered the scale of attitudes towards mathematics reached (489), and thus the number of members of this sample represented approximately 15% of the population. 205 of them were male and 282 were female students, and two did not determine their gender in the scale. As for the number of students who were interviewed to answer the interview related to teaching practices, their number reached (202) students, of whom (84) were male and (118) were female students, all of them with poor achievement in mathematics. Because they are studying the mathematics course for the second time after failing to pass it the previous semester.

The Study Instruments

1. Attitudes toward Mathematics Scale

After reviewing the educational literature related to attitudes towards mathematics, the researcher prepared an instrument that measured the scale of attitudes toward mathematics, which consisted of (30) items distributed on four axes:

The first axis: Is related to students' perceptions about the importance of mathematics, its status and role in life. This axis contains seven items.

The second axis: Is related to students' perceptions of the nature, characteristics, and learning possibility. This axis contains seven items.

The third axis: It is related to the behaviors that indicates the existence of attitudes among the students toward mathematics, whether positive or negative, and it contains seven items.

The fourth axis: It is related to the emotion and feeling aspect of students towards mathematics, and it contains nine items.

The items were phrased so that the student responds to each of the scale paragraphs according to five-point Likert scale by choosing one of the following alternatives: Strongly object, somewhat object, I do not know, somewhat agree, and strongly agree. Keeping in mind that some items are negative and others positive, and this has been taken into consideration upon data entry.

The questionnaire was designed on Google Drive and distributed by e-mail to all students of the joint first year who took the mathematics course during the second semester of the year 2018-2019, and they were urged to participate.

2. Interview Sample Questions Designed for Collecting Data on Teaching Practices

After reviewing the educational literature about the effect of teaching practices on students' attitudes towards mathematics, the researcher prepared an interview form, which consists of (15) items, Close-ended question. Each item expresses one of the teaching practices that are expected to affect the attitudes towards mathematics among students.

It includes two open-ended questions:

First: What are teaching practices that promote positive attitudes toward mathematics?
Second: What are teaching practices that promote negative attitudes toward mathematics?

The Close-ended question items were phrased so that the student responds to each of the scale paragraphs according to five-point Likert scale by choosing one of the following alternatives: Strongly object, somewhat object, I

do not know, somewhat agree, and strongly agree.

The questionnaire was designed on Google Drive and distributed by e-mail to all students of the joint first year who took the mathematics course during the second semester of the year 2018-2019. Rational for the study was explained to the students by mail and they were informed that the form would be filled during the interview. In the interview, the student is asked to open the interview form, then the idea behind the form and the mechanism of answering it are explained. After that, the first item of the form is explained and then the student was left in the room to choose the appropriate answers from his point of view to answer that paragraph. Then the second item is opened and explained to the student in order for them to answer it and so on until all the items in the form are completed.

The Validity of the Two Instruments

To verify the validity of the two instruments used in this study, the instruments were presented to five professors holding PhD in educational sciences, and two instructors holding Master's degree in mathematics. The necessary adjustments were made to the two instruments in light of the comments and suggestions made by the experts, after which the two tools were finalized.

The Reliability of the Two Instruments

To ensure the reliability of the scale of attitude toward mathematics, it was applied to a survey sample of (50) male and female students from the joint first year who took the mathematics course during the second semester of the year 2018-2019, and then calculated the reliability coefficient using the Cronbach's Alpha equation. The following table shows the **reliability** coefficients for the instrument axes in addition to overall **reliability** of the scale:

Table 1.

The Reliability Coefficients for the Instrument Axes in Addition to Overall Reliability of the Scale

No.	Axis	Stability coefficient
1	Students' perceptions about the importance of mathematics, its status and its role in life	0.89
2	Students' perceptions of the nature of mathematics, characteristics, and the possibility of learning it.	0.81
3	Behaviors that indicates the existence of an attitude among the students toward mathematics.	0.79
4	The emotional and affective aspect of students towards mathematics.	0.89
Total		0.95

As for the interview form, it was applied to (42) male and female students of the joint first year who took the mathematics course in the summer semester of the year 2019-2020, and then calculated the reliability coefficient using the Cronbach's Alpha equation, where the reliability coefficient of the interview form reached 94%.

In light of the aforementioned, it appears that the values of reliability coefficients for two instruments are suitable for the purposes of the study.

The Study Methodology

The descriptive and analytical approach was used, where the first question of the study was answered by applying the scale of attitudes toward mathematics to the common first-year students and identifying their attitudes.

The second question was also answered through remote interviews with students of the common first year to answer the items in the interview form related to teaching practices that develop positive attitudes towards mathematics among students.

Results

The first question states the following: "What are the attitudes of the joint first year

students at the Saudi Electronic University towards mathematics?"

To answer this question, the students' responses were entered on the scale of attitudes toward mathematics, and the scale was answered by giving the following alternatives: (Strongly agree, somewhat agree, neutral, somewhat opposed, very opposed) Values (5, 4, 3, 2), 1) and this applies to the positive items. As for the negative items, the values were the opposite: (1, 2, 3, 4, 5). Accordingly, the total score on the scale ranges between 30 and 150.

The level of consent for each item was divided into three categories:

Low = if the item average is less than 2.33

Medium = if the item mean is greater than 2.33 and less than 3.67

High = if the paragraph average is greater than 3.67

The SPSS statistical analysis program was used to analyze the students' responses.

The following table shows the arithmetic averages, standard deviations, and the level of approval for each scale paragraph.

Table 2.

The Arithmetic Averages, Standard Deviations, and the Level of Approval for each Scale Paragraph

No.	Paragraph	Average	Standard deviation	Level of consent
1	Mathematics help develop healthy thinking	3.89	1.089	High
2	The importance of mathematics is increasing day by day in the present time	3.55	1.144	Medium
3	Mathematics do not help me in solving everyday problems	2.45	1.237	Medium
4	Mathematics help me understand other school subjects	2.91	1.258	Medium
5	Studying math is a waste of time and pointless	3.34	1.332	High
6	Mathematics is far from real life	2.95	1.331	Medium
7	Mathematics has an important role in developing other sciences	3.66	1.117	Medium
8	Mathematics is a difficult subject	2.14	1.099	Low
9	Mathematics is a constantly evolving science	3.53	1.127	Medium
10	Mathematics has a precise language of its own	4.17	0.873	High
11	Mathematics is rigid and boring	2.59	1.274	Medium
12	Mathematics has a high degree of symmetry and aesthetics	2.81	1.259	Medium
13	Any student can learn mathematics if they have the desire to do so, mathematics can be understood.	3.71	1.185	High
14	Mathematics is all abstract symbols and complex theories	2.45	1.222	Medium
15	I avoid engaging in math-related discussions	2.79	1.276	Medium
16	I regularly access math websites	2.67	1.246	Medium
17	I feel low self-esteem when asked about a math question	2.88	1.273	Medium
18	I do the homework that my math teacher asks for	3.88	0.985	High
19	I make sure to watch science films and math documentaries	2.43	1.171	Medium
20	I feel tired and bored when I study math	2.39	1.253	Medium
21	I like to miss math class with or without an excuse	3.99	1.169	High
22	I make sure to read articles and books related to mathematics	2.50	1.104	Medium
23	A math test makes me to feel very anxious and afraid.	2.11	1.249	Low
24	Mathematics is my favorite subject	2.82	1.402	Medium
25	I love my math teacher	3.94	1.118	High
26	My interest in mathematics is minimal	2.57	1.264	Medium
27	I feel scared talking to my math teacher	3.61	1.232	Medium
28	I hate any scientific discipline that includes mathematics	2.92	1.428	Medium
29	I am overjoyed while I am in math class	2.81	1.266	Medium
30	I have a positive feeling about math	3.22	1.306	Medium

It is evident from the above table that seven items achieved a high level of approval, the highest of which is the tenth items which states "Mathematics is distinguished by its precise language," with an arithmetic average of 4.17 out of 5, followed by items (21) with an average of 3.99, followed by paragraph (25) with an average of 3.94.

The table also shows that most of the items had a medium level of approval, as their number

reached (22), while item (23) had the lowest average, which is 2.11 out of 5, and it is the only item that received a low level of approval and states: "A math test makes me to feel very anxious and afraid."

The following table shows the number of items, the arithmetic average, the standard deviation, and the level of approval for each scale axis.

Table 3.

The Number of Items, the Arithmetic Average, the Standard Deviation, and the Level of Approval for each Scale Axis

No.	Axis title	No. of paragraphs	Arithmetic average	Standard deviation	Average out of 5	Level of approval
1	Students' perceptions about the importance of mathematics, its status and its role in life	7	22.75	6.572	3.25	Medium
2	Students' perceptions of the mathematics nature, characteristics, and learning possibility	7	21.39	5.498	3.06	Medium
3	The behaviors that indicates the existence of attitudes among the students toward mathematics	7	21.03	5.562	3.00	Medium
4	The emotion and feeling aspect of students towards mathematics	9	26.49	8.277	2.94	Medium
	All scale paragraphs	30	91.67	23.510	3.06	Medium

It is evident from the above table that the general average of the attitudes toward mathematics scale was 91.67 out of 150, i.e. 3.06 out of 5. This means that the attitudes of the joint first year students at the Saudi Electronic University are not positive nor negative, but moderate. This level applies to all axes of the scale, where the average for the axis related to students' perceptions about the importance of mathematics, its position and its role in life was the highest, which is 3.25 out of 5, which is an average level, while the axis related to the emotional and feeling aspect of students towards mathematics got the lowest average, which is 2.94 5 which is also moderate.

From all of the above we come to the conclusion that the answer to the study's first question will be as follows:

Attitudes of students of the joint first year at the Saudi Electronic University towards mathematics are not positive nor negative, but rather moderate.

To answer the second question "What teaching practices lead to the development of positive attitudes towards mathematics from the students' point of view?"

To answer the question, the students' responses were entered on the interview form prepared for this purpose, and the questions

were answered by giving the following alternatives: (Strongly agree, somewhat agree, neutral, somewhat opposed, very opposed) Values (5, 4, 3, 2), 1). Accordingly, the total score on the scale ranges between 15 and 75.

The level of consent for each paragraph was divided into three categories:

Low = if the paragraph average is less than 2.33

Medium = if the paragraph mean is greater than 2.33 and less than 3.67

High = if the paragraph average is greater than 3.67

The SPSS statistical analysis program was used to analyze the students' responses.

The following table shows the arithmetic averages, standard deviations, and the level of approval for each paragraph.

Table 4.

The arithmetic averages, standard deviations, and the level of approval for each paragraph

No.	Axis title	Arithmetic average	Standard deviation	Score	Level of approval
1	The use of educational aids and technology during the lesson.	4.32	0.798	2	High
2	Diversifying teaching strategies.	4.20	0.854	8	High
3	Appropriately reinforce the desired behavior of the student.	4.28	0.831	4	High
4	Provide immediate feedback to students.	4.34	0.771	1	High
5	Considering individual differences among students.	4.19	1.058	9	High
6	Continuous emphasis on the importance of mathematics and its role in life.	4.04	1.050	13	High
7	Linking mathematics to student life through examples and exercises.	3.99	1.053	14	High
8	Linking mathematics with other subjects through examples and exercises.	3.92	1.128	15	High
9	Encouraging the student to express himself through dialogue and discussion in lectures.	4.21	0.982	7	High
10	Empowering the student while solving some exercises by himself during the lectures.	4.09	0.975	11	High
11	Utilize appropriate examples and exercises to clarify and simplify the mathematical ideas that are required to be explained to students.	4.28	0.877	4	High
12	The teacher shows students his love and appreciation for mathematics.	4.27	0.929	6	High
13	The teacher to stimulate the fun atmosphere during his mathematics lesson.	4.07	1.029	12	High
14	The teacher is keen to develop the student's self-confidence and ability to learn mathematics.	4.17	1.018	10	High
15	The teacher was keen to invest the lecture time to benefit the student in learning mathematics and increasing his understanding.	4.28	0.911	4	High
	All scale paragraphs	62.65	11.101		

It is evident from the above table that the overall average of students' responses to the interview form was 62.65 out of 75, meaning 4.18 out of 5, which means that the level of approval of the study sample on the model as a whole is high, meaning that they agree that the teaching practices mentioned in the model develop in them positive attitudes towards mathematics with a level of approval High.

The table also shows that all the items achieved a high level of approval because their arithmetic averages exceeded 3.67 out of 5. It also shows that the fourth paragraph received the highest ranking and stipulates "providing immediate feedback to students." With an average of 4.34 out of 5 and the next paragraph

is the first paragraph which has an average of 4.32, and the next paragraph is the third, eleventh and fifteenth paragraphs, where the arithmetic mean of those items is 4.28. The eighth paragraph had the lowest average of 3.92 out of 5.

The answers to the open-ended questions were as follows:

150 students have answered the question related to the teaching practices that enhance positive attitudes toward mathematics, and the answers were as follows:

90 students (60%) emphasized a lot of statements that indicate a good relation between the teacher and the student, such as: When the teacher is engaged, when the teacher treats the

student respectfully, when the teacher is gentle, when the teacher is humble, when the teacher is close to the student, when the teacher understands the student's circumstances, as well as other statements that can be expressed succinctly in one statement: A good student-teacher relationship.

74 students (49%) mentioned a lot of statements that indicate using educational means and education technology, such as: when the teacher uses the Data Show, when the teacher uses pictures and drawings to explain concepts, when the teachers displays films that clarify mathematical concepts, when he uses colors to explain concepts, as well as similar statements.

48 students (32%) answered with statements that indicate what the teacher offers to clarify and simplify the subject so that it becomes easy for students to understand, such as: When the teacher uses a lot of examples, when the teacher is capable to explain, when the teacher explains everything, when the teacher forces us to understand, when the teacher makes everything easy, as well as other similar statements.

Other answers provide different reasons that are not related to the issues already discussed such as: The teacher who is tolerant when it comes to exams, the teacher who allows students to attend lectures late, the teacher whose first lecture is mathematics, as well as other statements.

123 students (32%) answered the second question which is related to the teaching practices that augment negative attitudes toward mathematics, and the answers were as follows:

70 students (58%) wrote statements that indicate some qualities of the teacher, such as: When the teacher is boring, when the teacher is very serious, when the teacher is fretful, when the teacher is sharp-tempered, as well as other statements that hinder the students' love and understanding of mathematics.

40 students (33%) wrote statements that indicate practices that makes the mathematics lecture boring and monotonous, such as: When the teacher uses the same teaching techniques in every lecture, when the teacher's explanation is monotonous, when the teacher's voice is low, when the teacher controls the lecture in a way that prevents the students from participating, when the teacher doesn't allow any talking that is not related to the lecture's topic, as well as other similar statements.

25 students (20%) wrote statements about practices that lower their scores in mathematics, such as: when the exam's questions are hard, when there's a lot of homework, when the required material is huge, when the teacher

refuses to add bonus marks when students do well, as well as other statements.

The rest of the answers varied that they either cannot be categorized under specific titles, or don't indicate teaching practices, such as: When mathematics is hard, when the teacher favors some students over others in the mathematics lecture, when the teacher resumes explaining even after the lecture's duration is over, when mathematics is very abstract, as well as other statements.

Discussing the Results

The results of the first question showed that the attitudes of the joint first year students towards mathematics at the Saudi Electronic University are neither positive nor negative, but rather average, i.e. 3.06 out of 5, in the study of (Di Martino & Zan, 2001) they define some variables that may affect the attitude toward mathematics and given some expression that related to the definition of attitude like the emotion expression in the sentence of like or dislike, the expression of perception in sentence I can do it or not,. The third part of attitude is the vision that like when seeing the mathematic is.....

This result can be interpreted by the fact that students of the joint first year at the Saudi Electronic University in general suffer from poor achievement in mathematics, as stated in the study of (Al-Khatib, 2018). And due to the nature of the relationship between achievement in mathematics and attitudes towards it, it is natural that the attitudes of poor achievers in mathematics are negative towards mathematics, and this has been confirmed by many studies such as the aforementioned (Amatobi, V.E and Amatobi, 2020) study, which concluded that the relationship between achievement in mathematics and the availability of positive attitudes towards a strong positive relationship, as confirmed in the results of the study(Mahanta, 2012), this study also show the importance to develop good facilities to improve the achievement toward mathematics, it describe that gender may affect the attitude toward mathematics for an example the girls has poor attitude toward mathematics than men this due to the girls have low self-confidence usually and they always thought that they behind the men at normal cases.

In (Amatobi, V.E and Amatobi, 2020) describe that gender may influence the attitude pattern toward mathematics, females always have low self-confidence so that they always have poor attitude toward mathematics than males.

The interpretation of this result could also be the characteristics of the sample members,

as most of the joint first year students at the Saudi Electronic University are mature students who have been out of the educational system for a long time and therefore are rusty in mathematical skills and are unprepared overall for the requirements of academic rigor that is required for university education. They therefore are not expected to have positive attitudes towards mathematics.

As for the result of the second question, it was found that the sample individuals agree that the practices mentioned in the interview form lead to the development of positive attitudes towards mathematics, which was highly agree at level 4.18 out of 5, and this result is consistent with the results of the study (Kelly, 2012) which indicated that teachers were the most influential in students' attitudes towards mathematics, as well as with the study of (Akinsola & Olowojaiye, 2008) that mentioned some question based practices as one of teacher based practices that improve the attitude toward mathematics in senior secondary school.

This result is also consistent with the results of the study (Shamila Dewi Davadas 1, 2018). This thought to develop positive attitudes towards mathematics among students, through teacher effective support and classroom instructions. This confirmed also by the study of (Mata et al., 2012) that part of the questionnaire is about peer support of teacher and its relation to enhance positive attitude toward mathematics.

The interpretation of this result could be the conviction that the sample members formed about these teaching practices and the extent of their impact on developing positive attitudes towards mathematics, because the students who were interviewed obtained a detailed explanation about those practices during the interview, as each of those practices was clarified in the interview form, from a conceptual and procedural point of view, that is to clarify the significance of the concept contained in the practice and how it is procedurally implemented by the teacher, for example: To explain the practice of "Providing immediate feedback to students" The concept of immediate feedback was explained, then the procedures that the teacher implements it to provide immediate feedback to students are explained, the same thing goes to explain the practice "Using educational aids and educational technology during the presentation of the lesson", the concept of teaching aids and the concept of educational technology are explained, and then the actions taken by the teacher when using educational aids and educational technology are explained, and so on for the rest of the proposed teaching practices mentioned in the interview form. It is expected that the students who were interviewed had a good knowledge and strong conviction of the

importance of these practices and their great impact in elevating their level in mathematics, increasing their achievement in it, and developing positive attitudes towards it.

The results also showed that the teaching practice related to "providing immediate feedback to students" ranked highest, with an average of 4.34 out of 5, and the practice "using teaching aids and teaching technology during the presentation of the lesson" ranked second with an average of 4.32 out of 5. As for the practices of "Employing appropriate examples and exercises to clarify and simplify the mathematical ideas required to be explained to students" and "The teacher's keenness to invest the lecture time to benefit the student in learning mathematics and increasing his understanding" all ranked fourth with an average of 4.28 out of 5.

Despite the advancement of previous teaching practices over others in terms of the level of approval, all practices have achieved a high level of approval. All of them have close averages, meaning that we can view these practices with the same degree of importance in their impact on students' attitudes towards mathematics.

This result is consistent with the results of studies and research that have studied the effect of some teaching practices on students' attitudes towards mathematics, and one example of those studies is the study Hammy and (Shamila Dewi Davadas 1, 2018) which concluded that the use of a social constructive learning strategy improves the attitudes of second-year students average towards Math. While the study (Siew et al., 2016) concluded that entertainment-based learning such as video games has a positive effect on the development of some thinking skills in algebra and the attitude towards it among the middle score until master. The study (Demirci, 2017) found the effectiveness of programs based on active learning in developing culture allow student to focus on creating emphasis on the skills such as analytical thinking and meta cognitive which will be in relation with the attitude toward mathematics. The study (Tabuk, 2018) also found the positive effect of attitude of teachers not only toward mathematics but also toward teaching mathematics have a positive influence on the student attitude toward mathematics in the primary schools. All these studies and many more confirm the positive impact of teaching practices on attitudes towards mathematics.

The interpretation of the increased level of approval for higher ranked practices may be that these practices are directly related to increasing mathematics achievement, as well as their connection to attitudes toward mathematics. Since all these practices are expected to solve their problem of passing the mathematics

subject, which means the students expect these practices to increase their ability to understand the ideas in the mathematics subject and increase their achievement, and enable them to pass the course, as immediate feedback provides insight into the student's strengths and weaknesses, and this increases the student's ability to enhance his strengths and overcome his weaknesses. In addition, the use of educational aids and educational technology in explaining mathematical ideas contributes to clarifying these ideas and facilitates their comprehension, and reinforcement can be viewed as a method of feedback because it plays the same role. In addition, it is possible to look at the practice related to utilizing examples and exercises in the same way, as well as the teacher's investment in time to provide explanation and clarification.

Recommendations

In light of the findings of the study, the researcher recommends the following:

1. Professional development for math teachers to perfect their teaching practices related to developing positive attitudes towards mathematics among students.
2. Encouraging mathematics teachers to utilize the largest possible number of teaching practices related to developing positive attitudes towards mathematics among students, during teaching the mathematics subject.
3. Looking at the issue of attitudes towards mathematics as one of the most important ways to address students' underachievement in mathematics.
4. Conducting experimental studies to increase the assurance of the effect of teaching practices in developing positive attitudes towards mathematics among students.

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References

- Aiken, L.R. (1963). Personality Correlates of Attitude toward Mathematics. *The Journal of Educational Research*, 56(9), 476–480. <https://doi.org/10.1080/00220671.1963.10882987>
- Akinsola, M.K., & Olowojaiye, F.B. (2008). Teacher instructional methods and student

attitudes towards mathematics. *International Electronic Journal of Mathematics Education*, 3(1), 60-73.

- Al-Khatib, K. (2018). The reasons for poor achievement in mathematics for joint first-year students at the Saudi Electronic University from the viewpoint of students and their teachers. *Journal of Social Sciences*, 7(28).
- Al-Zoubi, S.M., & Younes, M.A.B. (2015). Low Academic Achievement: Causes and Results. *Theory and Practice in Language Studies*, 5(11), 2262-2268. <https://doi.org/10.17507/tpls.0511.09>
- Amatobi, V.E., & Amatobi, D.A. (2020). The influences of gender and attitude differences to students' achievement in mathematics in Nigerian secondary schools: a case study of Comprehensive Secondary School Amurie-Omanze in South Eastern Nigeria. *American Journal of Research Communication*, 8(2), 1–8.
- Andaya, O.J.F. (2014). Factors That Affect Mathematics Achievements of Students of Philippine Normal University – Isabela Campus. *Journal of Arts, Science & Commerce*, 5(4), 83–91.
- Chen, L., Bae, S.R., Battista, C., Qin, S., Chen, T., Evans, T.M., & Menon, V. (2018). Positive Attitude Toward Math Supports Early Academic Success: Behavioral Evidence and Neurocognitive Mechanisms. *Psychological Science*, 29(3), 390–402. <https://doi.org/10.1177/0956797617735528>
- Cross Francis, D. (2008). Creating optimal mathematics learning environments: Combining argumentation and writing to enhance achievement. *International Journal of Science and Mathematics Education*, 7, 905–930. <https://doi.org/10.1007/s10763-008-9144-9>
- Fay, D.L., et al. (1967). *Angewandte Chemie International Edition*, 6(11), 951-952.
- Demirci, C. (2017). The Effect of Active Learning Approach on Attitudes of 7th Grade Students. *International Journal of Instruction*, 10(4), 129–144. <https://doi.org/10.12973/iji.2017.1048a>
- Di Martino, P., & Zan, R. (2001). Attitude toward mathematics: some theoretical issues. *Conference: 25th Conference of the International Group for the Psychology of Mathematics Education*, 3, 209–216. https://www.researchgate.net/publication/265049550_Attitude_toward_mathematics_s_ome_theoretical_issues
- Tahar, N.F., Ismail, Z., Zamani, N.D., & Adnan, N. (2010). Students' attitude toward mathematics: The use of factor analysis in determining the criteria. *Procedia-Social and Behavioral Sciences*, 8, 476-481.

- Davadas, S.D., & Lay, Y.F. (2017). Factors affecting students' attitude toward mathematics: A structural equation modeling approach. *Eurasia Journal of Mathematics, Science and Technology Education*, 14(1), 517-529.
- Estevez, E. (2005). Student beliefs in the mathematics classroom: A study of how African American and Hispanic ninth and twelfth graders perceive mathematics and the mathematics classroom. *Unpublished Doctoral Thesis*.
- Fan, L., Quek, K.S., Zhu, Y., Yeo, S.M., Pereira-Mendoza, L., & Lee, P.Y. (2019). Assessing Singapore Students' Attitudes toward Mathematics and Mathematics Learning: Findings from a Survey of Lower Secondary Students. *Journal of Chemical Information and Modeling*, 53(9), 1689–1699.
- Krosnick, J.A. (1989). Attitude importance and attitude accessibility. *Personality and Social Psychology Bulletin*, 15(3), 297-308.
- Geary, D.C. (2012). Learning Disabilities and Persistent Low Achievement in Mathematics. *Journal of Developmental and Behavioral Pediatrics*, 32(3), 250–263.
- Gilson, J. (1999). Single-Gender Education versus Coeducation for Girls: A Study of Mathematics Achievement and Attitudes toward Mathematics of Middle-School Students. <http://search.proquest.com/docview/62468882?accountid=13158>
- Gorard, S. (2008). (Mis)Understanding underachievement: A response to Connolly. *British Journal of Sociology of Education - BRIT J SOCIOL EDUC*, 29(6), 705-714. <https://doi.org/10.1080/01425690802423379>
- Haney, J.J., & McArthur, J. (2002). Four Case Studies of Prospective Science Teachers' Beliefs Concerning Constructivist Teaching Practices. *Science Education*, 86(6), 783–802. <https://doi.org/10.1002/sce.10038>
- Howel, R.J.M.J.R.C. (2016). Supporting teachers in becoming agents of social cohesion: professional development in Post-apartheid South Africa. *Education as Change*, 20(3), 160–179.
- Kelly, D.K. (2012). In students' words: The development of student attitudes toward mathematics---a social perspective. *Dissertation Abstracts International Section A: Humanities and Social Sciences*, 72 (8-A), 2741.
- Macmillan/McGraw-Hill, (2007). *Research Base of Effective Mathematics Instruction McGraw-Hill's Math*.
- Mahanta, D. (2012). Achievement in mathematics: effect of gender and positive/negative attitude of students. *International Journal of Theoretical & Applied Sciences*, 4(2), 157–163.
- Maria, D.L.M., Monteiro, V., & Peixoto, F. (2012). Attitudes towards Mathematics: Effects of Individual, Motivational, and Social Support Factors. *Child Development Research*. <https://doi.org/10.1155/2012/876028>
- Maze, J.R. (1973). The concept of attitude. *Inquiry*, 16(1–4), 168–205. <https://doi.org/10.1080/00201747308601684>
- Petrilli, M.J., & Scull, J. (2011). *American Achievement in International Perspective*. <http://search.proquest.com/docview/870287277?accountid=13042>
- Relich, J., Way, J., & Martin, A. (1994). Attitudes to teaching mathematics: Further development of a measurement instrument. *Mathematics Education Research Journal*, 6(1), 56–69. <https://doi.org/10.1007/BF03217262>
- Rubagiza, J., Umutoni, J., & Kaleeba, A. (2016). Teachers as agents of change: Promoting peacebuilding and social cohesion in schools in Rwanda. *Education as Change*, 20. <https://doi.org/10.17159/1947-9417/2016/1533>
- Saunders, J.M. (2014). The flipped classroom: Its effect on student academic achievement and critical thinking skills in high school mathematics. *ProQuest Dissertations and Theses*, 76(3-A(E)), 128. http://eduproxy.tc-library.org/?url=/docview/1639087375?accountid=14258%5Cnhttp://vq2st5lq8v.search.serialssolutions.com?ctx_ver=Z39.88-2004&ctx_enc=info:ofi/enc:UTF-8&rft_id=info:sid/ProQuest+Dissertations+&+Theses+Global&rft_val_fmt=info:ofi/fmt:kev:mtx
- Sayed, M.N.Y. (2016). Teachers as agents of sustainable peace, social cohesion and development: theory, practice & evidence. *Education as Change*, 20(3), 15–37.
- Şen, H.Ş. (2013). The Attitudes of University Students Towards Learning. *Procedia - Social and Behavioral Sciences*, 83, 947–953. <https://doi.org/10.1016/j.sbspro.2013.06.177>
- Shamila Dewi Davadas, Y.F.L. (2018). *Factors Affecting Students' Attitude toward Mathematics: A Structural Equation Modeling Approach*, 14(1), 517–529.
- Siew, N.M., Geoffrey, J., & Lee, B.N. (2016). Students' Algebraic Thinking and Attitudes Towards Algebra: the Effects of

- Game-Based Learning Using Dragonbox 12 + App. *The Research Journal of Mathematics and Technology*, 5(1), 66–79.
- Tabuk, M. (2018). Prospective Primary School Teachers' Attitudes Towards Teaching Mathematics. *Journal of Education and Learning*, 7(4), 225-229.
<https://doi.org/10.5539/jel.v7n4p225>
- Zan, R., & Di Martino, P. (2008). Attitude Toward Mathematics: Overcoming the Positive/Negative Dichotomy. *The Montana Mathematics Enthusiast, Monograph*, 157–168.
- Zusho, A., Pintrich, P., & Cortina, K. (2005). Motives, goals, and adaptive patterns of performance in Asian American and Anglo American students. *Learning and Individual Differences*, 15(2), 141–158.
<https://doi.org/10.1016/j.lindif.2004.11.003>
- Macy, M. (2010). Interactive online assessment options: A review of the AEPSi. *International Journal of Early Childhood Special Education*, 2(3), 254-257.