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# The effect of active learning method on students' attitude towards mathematics

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**Abstract**

The world is changing so fast, and therefore education needs to adapt to the challenges of times. In order to update the content of school education in the Republic of Kazakhstan modern trends are going to be used. These trends contain pedagogical methods that can be used to preserve and even increase internal motivation, as active learning. Active learning method is an treatment where students participate or interact with the learning process, as opposed to passively taking in the information.

The goal of this study is to identify the impact of active learning method on 10th grade students' attitude towards mathematics of the students the second semester of the school year 2019-2020. More specifically, it attempted to determine and compare the attitude toward mathematics of students' exposure to active learning and traditional teaching strategy. The Likert scale used to evaluate the attitude of students toward mathematics. Mean, Cronbach $\alpha$ value, T-test were the statistical tools used in anatomizing and interpreting the research data. The discovering showed that the students in the active learning group had auspicious attitude than students in the conventional teaching group. According to the findings after research, we saw the direct relation between attitude and active learning. It is concluded that the students' attitude toward mathematics was better by using active learning strategy. It is recommended that mathematics teacher should use active learning strategy in order to improve the attitude toward mathematics of the students.

*Keywords*: attitude, mathematics, active learning

The role of repetition in learning math

In this article, we interested in the attitude of 10th grade students toward mathematics and in case of a negative attitude, we offer the active learning method. Generally, we explored how the using of active learning method in teaching mathematics can affect or change the attitudes according to this lesson among students. Surveys conducted by scientists and organizations show disappointing results. Therefore, according to a TSU survey, 61% of 15-year-olds students concern that they will get poor math grades, 30% are nervous when they solve math problems, and 59% say they think math is too sophisticated. [7] It can be seen that many students suppose mathematics as a difficult and complicated lesson. Such attitude may have some aftermaths in learning process. American researchers also confirm the mentions above and claim that "emotional behaviors are very lifelong in the process of learning mathematics because it is seen by the students mathematics is as difficult, complicated and boring subject" [3]. In accordance with Aiken, attitude toward mathematics is determined as "attitude to mathematical activity depends on whether you like this subject or not; assessment in mathematics is directly related to his belief in the benefits of mathematics in life" [4]. It means that the successfully learning of mathematics primarily depends on the attitude itself.

If every teacher wants his students well understand mathematics, first, he needs to change the relation toward the subject. Several research studies have demonstrated a positive connection between mathematics achievement of student and their attitude toward mathematics [10], [9]. In this case as the most effective instrument, we are considering the active learning method. The evidence supporting the positive effects of active learning methods in math and science courses after graduating from high school is so convincing that Freeman made a statement in the 2014 National Academy of Sciences (PNAS): "Active Learning Enhances student achievement in science, technology and mathematics"[5]. The active learning method is becoming a

progressively important part of mathematics courses and used to improve attitudes towards mathematics in many countries [8]. The method of active learning is an approach in which students participate in the educational process through the accumulation of knowledge and understanding. In schools, they usually do this in response to the learning opportunities developed by their teacher. In addition, active learning requires students to work hard and use new knowledge and skills to develop a deeper understanding. This deeper understanding will also allow students to combine different ideas and think creatively [1]. In the context of mathematics, approaches to active learning involve students in the study of mathematical problems, putting forward and testing hypotheses, developing evidence or solutions, and explaining their ideas. As students learn new concepts through argumentation, they also begin to see mathematics as a creative human make efforts to which they can endow. [6].

There are active learning techniques that used in our experimental classes.

First is Think-Pair-Share. Here, a teacher gives his learners a short mathematical task such as computation, solving a problem, completing a proof, generating several examples, or forming a hypothesis or conjecture. At first, students consider the task ("think") independently by giving those 2-3 minutes. Next, students take two minutes to compare their answers with other students sitting nearby ("pair"). Finally, some or all students are encouraged to share their answers either with neighboring groups or with the entire class ("share"). Providing students' time for reflection and discussion of mathematics in the middle of the lecture contributes to their active participation in the lesson. This task is not important for faculties or institutions and serves as an effective test of understanding in which students can reorient their attention during the lecture.

Second is Inverted (or "Flipped") Classes. In this technique, an instructor provides basic definitions, examples, proofs, and heuristics to students in videos or in assigned readings that are

completed prior to attending class. In this case, a classroom environment becomes available for active learning tasks that directly engage students. Instructors during this time can apply different types of tasks from using think-pair-shares with complex problems or examples to having students work in small groups on a sequenced activity worksheet with occasional instructor or learning assistant feedback.

Third is Inquiry-Based Learning (IBL). This method is considered as the most popular among active learning methods in mathematics. In IBL courses, students work on tasks individually or in groups and show their solutions and/or proofs to the class, to receive feedback from peers [11]. By this teaching method, students can learn new concepts through argumentation; as a result, they may see mathematics as creative human making efforts to which they can contribute. In general, IBL methods emphasize the individual construction of knowledge, supported by social interactions with peers [6].

**Methods**

Research Design: In this study, two groups were chosen – one for the active learning method and the other one for the traditional method. For both of the group the attitudinal scale was operated to measure the students' attitude toward mathematics. The result of this test was the basis for reporting and collating their attitude.

Subjects: The 10th grade students during the 2nd semester of 2019-2020 the school year, consisting of 50 students were used in this study: 25 students for active learning method, 25 students for traditional method.

Instrument: The Likert scale used to evaluate the attitude of students toward mathematics. This is the main data-gathering instrument used in this study.

Statistical Treatment of data: The succeeding statistical tools were used in the study. Mean was used to determine the students' attitude toward mathematics because all items were

positive. 1 – Strongly disagree, 2 – Disagree, 3 – Neither Agree nor Disagree, 4 – Agree, 5 – Strongly Agree. Cronbach α value of the attitude scale was determined [13]. T-test was used to determine if there is significant difference between the mean of two groups.

**Results and discussion**

The attitude toward mathematics of the students by active learning method and by traditional method was computed using the mean, because all statements were positive.

Table 1 presents the attitude toward mathematics of students by active learning method and by traditional method. The students exposed to traditional method had neutral attitude to the strategy as indicated by the overall mean of 3,43. The students exposed to active learning method had agree attitude to the strategy as indicated by the overall mean of 3,57.

In Table 2 and Table 3 we can find a difference of answers. Most of the answers of students (active learning) are strongly agree, especially in statements: good scores, preparation for exams, learning math with pleasure and feeling secured in math classes. The difference of strongly disagree answers of students were more in traditional method group.

Cronbach α value for the active learning group was 0,94, while Cronbach α value for the traditional method group was 0,87.

T-test result by means of two groups was 0,15. As we know if the p value will be less than 0,5 it is significant difference between two means.

**Summary of Findings**

The overall mean of the attitude toward mathematics of the students revealed to active learning was 3,57 while 3,43 of the students revealed to traditional method. There is a difference between the attitude of the students before their exposure to active learning and conventional teaching strategy as indicated by Cronbach α value 0,94 to 0,87. T-test result by means of two groups was significant and it equal to 0,15.

### Conclusion and recommendation

At the end of the research we found that in the group of students, where the active learning method was practiced, had advantageous attitude than students in the conventional teaching group. According to the results of the study, we can conclude that the active learning is an effective teaching strategy to influence students' attitude toward mathematics in order to make it positive. The active learning strategy is recommended to use by mathematics teachers for improving students' attitude toward mathematics.

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Tables

Table 1

Attitude toward Mathematics of the Students by Active Learning and by Traditional Method

| No | Statement | Traditional method | | Active Learning | |
|---|---|---|---|---|---|
| | | Mean | Response | Mean | Response |
| 1 | I enjoy studying mathematics. | 3,56 | Agree | 3,8 | Agree |
| 2 | I find mathematics to be very interesting. | 3,56 | Agree | 3,52 | Agree |
| 3 | I prepare myself carefully for exams in mathematics | 3,84 | Agree | 4,28 | Agree |
| 4 | I get good scores in mathematics | 3,64 | Agree | 4,04 | Agree |
| 5 | I feel a positive reaction to mathematics. | 3,72 | Agree | 3,72 | Agree |
| 6 | I learn mathematics with pleasure. | 3,6 | Agree | 3,68 | Agree |
| 7 | I know I can do well in mathematics. | 3,24 | Neutral | 3,24 | Neutral |
| 8 | I feel secured in my mathematics class. | 3,44 | Neutral | 3,56 | Agree |
| 9 | I am happier in my mathematics class than | 3 | Neutral | 2,92 | Neutral |

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| | in any other subjects. | | | | |
| 10 | I can handle more difficult mathematics problems. | 2,96 | Neutral | 3,28 | Neutral |
| 11 | I am willing to take more than the required unit of mathematics in general education. | 3,44 | Neutral | 3,28 | Neutral |
| 12 | I am able to solve problems in mathematics without too much difficulty. | 3,12 | Neutral | 3,52 | Agree |
| | **Overall** | 3,43 | Neutral | 3,57 | Agree |

Table 2

Answers of students which exposed to traditional method

| **Questions** | Strongly disagree (%) | Disagree (%) | Neutral (%) | Agree (%) | Strongly agree (%) |
|---|---|---|---|---|---|
| I enjoy studying mathematics. | 8% | 4% | 24% | 52% | 12% |
| I find mathematics to be very interesting. | 8% | 0% | 36% | 40% | 16% |
| I prepare myself carefully for exams in mathematics | 0% | 0% | 28% | 60% | 12% |
| I get good scores in mathematics | 4% | 0% | 36% | 48% | 12% |
| I feel a positive reaction to mathematics. | 4% | 0% | 32% | 48% | 16% |
| I learn mathematics with pleasure. | 4% | 0% | 36% | 52% | 8% |
| I know I can do well in mathematics. | 8% | 4% | 52% | 28% | 8% |
| I feel secured in my mathematics class. | 8% | 0% | 40% | 44% | 8% |
| I am happier in my mathematics class than in any other subjects. | 8% | 16% | 52% | 16% | 8% |
| I can handle more difficult mathematics problems. | 4% | 24% | 52% | 12% | 8% |
| I am willing to take more than the required unit of mathematics in general education. | 4% | 4% | 52% | 24% | 16% |
| I am able to solve problems in mathematics without too much difficulty. | 8% | 12% | 48% | 24% | 8% |

Table 3

Answers of students which exposed to active learning

| Questions | Strongly disagree (%) | Disagree (%) | Neutral (%) | Agree (%) | Strongly agree (%) |
|---|---|---|---|---|---|
| I enjoy studying mathematics. | 0% | 12% | 20% | 44% | 24% |
| I find mathematics to be very interesting. | 0% | 20% | 24% | 40% | 16% |
| I prepare myself carefully for exams in mathematics | 0% | 8% | 8% | 32% | 52% |
| I get good scores in mathematics | 0% | 4% | 24% | 36% | 36% |
| I feel a positive reaction to mathematics. | 4% | 4% | 28% | 44% | 20% |
| I learn mathematics with pleasure. | 4% | 8% | 32% | 28% | 28% |
| I know I can do well in mathematics. | 0% | 24% | 32% | 40% | 4% |
| I feel secured in my mathematics class. | 4% | 8% | 32% | 40% | 16% |
| I am happier in my mathematics class than in any other subjects. | 16% | 16% | 32% | 32% | 4% |
| I can handle more difficult mathematics problems. | 4% | 12% | 40% | 40% | 4% |
| I am willing to take more than the required unit of mathematics in general education. | 12% | 8% | 32% | 36% | 12% |
| I am able to solve problems in mathematics without too much difficulty. | 0% | 16% | 28% | 44% | 12% |