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LEARNING MODEL WITH STEAM APPROACH ASSISTED LKPD AND QUIZIZZ TO IMPROVE STUDENT PROBLEM SOLVING ABILITY

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Abstract
The purpose of this study was to determine the increase in students' mathematical problem solving abilities which were taught with STEAM model lessons assisted by LKPD and Quizizz. STEM education is defined as an integrated learning approach from the concepts of science, technology, engineering and mathematics. The subjects used were class X students and samples taken in class X1 and X2 were 50 students of MA. Al-Fatah Palembang for the 2020-2021 academic year. Quasi-experimental method used in this study. STEAM model lessons assisted by LKPD and Quizizz show a higher KPMM than students who receive conventional learning, it can be seen from the count > t table, namely 9.78 > 1.71 t-test formula. Assuming that there are differences in the treatment of the control class in class X MA.Al-Fatah Palembang students, it can be concluded that the average test scores using STEAM models assisted by LKPD and Quizizz are better than conventional learning

Keywords : Quizizz, LKPD, Problem Solving ability

INTRODUCTION

Education is an effort made to prepare students through learning activities that aim to help students actively develop their potential, abilities and talents and learning in the world of education must be able to improve students' process skills and social skills which of course affect the quality of human resources produced. produced (Anggita Septiani, 2014). One form of education reform can be carried out using a learning approach that can assist teachers in creating experts, namely the STEAM (Science Technology Engineering Art Mathematics) approach. This STEAM approach is an approach that refers to the four components of science, namely science, technology, engineering, and integrated mathematics. STEM education is defined as an integrated learning approach from the concepts of science, technology, engineering and mathematics (Syukri et al., 2013). is a combination of STEM with elements of "Art" or art.

STEAM or Science, Technology, Engineering, Art, and Mathematics is an integrated learning that can be said to foster problem-solving skills in students (Yuliari & Hanim, 2020). Mathematics learning embedded with STEAM nuances will increase students' interest in learning mathematics because the learning atmosphere will be more enjoyable by combining mathematics with elements of nature, technology, engineering, and art. Furthermore, this will also have an impact on increasing levels of understanding, creativity, and skills. students' mathematical problem-solving abilities. According to Reza (2017), the STEAM approach using project-based learning can develop students' soft skills, namely working together, communication, critical thinking, caring for the environment, hard work, adaptation skills, responsibility, creative thinking, leadership, curiosity and honesty. The steps in the STEM learning approach are as follows (Syukri et al., 2013):

1. Observation step (Observe) Students are motivated to make observations on various phenomena/issues that exist in the environment of everyday life that are related to the science concept in the lesson being discussed.
2. New idea step (New Idea) Students observe and seek additional information about various phenomena or issues related to the science topics discussed, after which students think of new ideas from existing information. At this step students need skills and analyze and think critically.
3. Step innovation (Innovation) Students are asked to describe what things must be done so that the ideas that have been generated in the previous new idea step can be applied.
4. Step creation (Creativity) This step is the implementation of all the suggestions and opinions resulting from the discussion regarding ideas that can be applied.
5. Value step (Society) This is the last step that must be owned by students from the ideas generated by students in the form of a value that can be useful for social life.

Facts on the ground show that student problem solving is still low. It can be seen from the data that the average score for mathematical ability is still far below the standard, only reaching 379 out of the OECD average score of 487. Interesting findings from PISA 2018 include that Indonesia is in the low performance quadrant with high equity. Then, it was also found that the gender gap in performance, the gap in learning performance between women and men was not large. Female students are better than male students in all fields in PISA (Schleicher, 2018).

It was found that the facts obtained from the observations of 110 high school students, using the problem-solving test test that the author did, it was seen that only 34 people were thorough in answering the questions meaning that only 30% were complete. While the other 76 students did not complete the questions, meaning that 70% were incomplete. Moreover, in MA Nurul Falah Palembang it was found that out of 50 students who were tested only 12 students passed the KKM (24%) while 38 (76%) did not pass the KKM and the results of observations of MA Nuruh Falah Palembang found that the phenomenon of the implementation of learning that occurred was (1) the teacher in teaching still uses conventional methods that are less creative and active, (2) the teacher still lacks understanding of the STEAM learning model.

This requires serious efforts in handling. Teachers as spearheads in efforts to improve students' abilities certainly need to increase their professionalism, so that it becomes one of the possible efforts in this problem, especially the teacher's ability to provide variations in learning (Wardoyo, Herdiani, Susilowati, & Harahap, 2020). Based on the above description theoretically that students can learn more fun and comfortable using learning with a learning model with the STEAM approach assisted by LKPD and Quizizz in improving students' problem-solving abilities.

METHOD

Quasi-Experimental is a method in this research. Subjects are accepted as they are so that random grouping is no longer done (Ruseffendi, 2015). In this study, the research subjects were given treatment and then the effect of the treatment was seen by using a learning model with the STEAM approach assisted by worksheets and Quizizz which was applied to the experimental class and conventional learning to the control class. Learning using learning models with the STEAM approach assisted by LKPD and Quizizz is the independent variable, mathematical problem solving ability (KPMM) is the dependent variable in this learning. And the control variable is students' initial ability (KAS). Based on students' initial abilities, three categories of KAS were obtained, namely: low KAS, medium KAS, and high KAS categories. Students' initial abilities are obtained from test results regarding the material to be provided. The dependent variable is studied, in terms of learning, KAS, and all students.

Class X students became the population in this study, while the sample was students from class X1 and X2. Matrix learning material with sub-subject matter of Arithmetic Sequences and Geometry Series. Odd semester 2020-2021. Purposive sampling is a sampling technique. To determine the research sample, the following steps were taken:

1. Record class X students in the odd semester of the 2020-2021 academic year. Schedule of lessons and administration required by the school that regulates it.
2. Choose 2 experimental classes using purposive sampling by considering the efficiency of time, cost, and also classes X1 and X2 usually use computers in learning. The classes selected by purposive sampling were class X1 and X2.
3. Testing the equality of the quality of KAS class X1 and X2 in these classes for the experimental class (learning model with the STEAM approach assisted by LKPD and Quizizz) and conventional learning.

The data in this research is distinguished by quantitative data. Quantitative data were obtained through Mathematical Problem Solving Ability Tests, which were carried out before (pretest) and after (posttest) learning activities. Qualitative data were analyzed descriptively to support the completeness of the quantitative data. Quantitative data was tabulated and analyzed through four stages, namely: First, conduct a student initial ability test for each sample class to determine the equivalence between the experimental class and the control class. Calculating and analyzing data from the normalized gain of the two sample classes, namely the normality test and homogeneity test. If you have obtained control and experimental classes from the normality and homogeneity tests of these classes, they are used in the study. Then carry out a test for the difference in mean data for increasing KPMM based on learning and KAM from student post-test scores from the two sample classes to find out which sample class is categorized as being able to improve student problem solving in learning.

RESULTS AND DISCUSSION

Data were analyzed descriptively to determine the mean and standard deviation of students' pre-test, post-test and n-gain KPMM scores based on learning, KAS, and overall. The results of the instrument try-out obtained 4 valid and reliable questions for testing students' mathematical problem solving abilities which consisted of 10 indicators analyzed. Increasing students' KPMM based on learning (MSCBL and PK), KAS (high, medium, low), and all of them more clearly. Prior to carrying out the test, prerequisite analysis tests were first carried out, namely data normality tests and variance homogeneity tests. From the result date Mean (X) = 7.048 Standard deviation = 1.1. With $\alpha = 0.05$ then L table = 0.17. Because Lo < Ltable, the data is normally distributed with 0.0758 <0.173, so the data is normally distributed

Table . TKAM Data Normality Test Based on Sample Class for Control Class (X1)

fi	xi	Zi	F(zi)	S(zi)	F(zi) – S(zi)	mut F(zi) – S(zi)
5	5	-1.49	0.0294	0.0750	-0.0456	0.0456
8	6	-0.43	0.1899	0.3500	-0.1601	0.1601 Lo
5	7	0.13	0.5501	0.7500	-0.1999	0.1120
6	8	1,13	0.8716	0.9500	-0.0784	0.0653
1	9	2,14	0.9839	1.0000	-0.0161	0.1473

Average (X) = 6.263 Standard deviation = 1.02 With $\alpha = 0.05$ then L table = 0.173. Because Lo < Ltable, the data is normally distributed with 0.1601 <0.173, so the data is normally distributed

Table . TKAM Data Homogeneity Test Based on Sample Class

Class	Average	Variance (range)	X2 count
Control Class (X1)	6,263	0.241	S2 x2/ S2 x1 =
Experiment Class (X2)	7,048	0.289	1.065

If the value is set $\alpha = 0.05$ then the value of X2 table with df = N -3 then X2 is 11.689 because χ^2count < than χ^2table, it can be concluded that the two samples are homogeneous. As seen in the table above, namely in tables 4.5 and 6 it can be seen that the data is normally distributed and homogeneity. Therefore, to find out whether there is a difference in the average KPMM increase between the two

learning groups (SLQ and PK) can be done using the t-test. The summary of the results of the t test can be seen in Table 7 below:

Table. Test of Differences in Average KPMM Increase Data Based on Learning and KAS

No.	Conventional method test results	SLQ model test results	d 1	d 2
1	5.86	7.50	1.64	2.69
2	5,52	6,82	1,3	1.69
3	8,25	7.45	0.8	0.64
4	7,84	7.00	0.84	0.71
5	5,18	8.40	3,22	10,4
6	7.08	7.50	0.42	0.18
7	5.45	7.80	2.35	5,5
8	6,42	8.0	1.58	2,5
9	6,46	9.0	2.54	6,45
10	4,12	8.33	4,21	17,7
11	6,43	7,54	1.11	1,2
12	4.64	8,83	4,19	17,6
13	6.06	7,62	1.56	2.43
14	7,69	8.33	0.64	0.41
15	6,33	6,81	0.48	0.23
16	5.86	7,83	1.97	3.88
17	6,19	5,51	0.68	0.360
18	5,46	7.05	0.64	0.41
19	8,19	8.75	0.57	0.32
20	6,15	7.50	0.04	0.00
21	5.01	8.00	0.04	0.00
22	4,14	6.50	0.48	1.64
23	3,14	7.00	2.02	4.00
24	6,16	7.50	0.96	0.91
25	8,18	8.50	0.04	0.00
26	5.55	8.00	0.06	0.00
27	6,38	7.50	0.35	0.72
28	7,11	6.90	0.30	0.90
29	7,31	9.00	0.18	0.03
30	6,36	9.00	2.64	4.49
Amount			26.75	40,14

Because t count > t table is 9.78 > 1.71, it can be concluded that the average test score using the learning model with the STEAM approach assisted by LKPD and Quizizz is better than conventional learning.

Data collection technique

The data collection method used in this research is a test, the test method is used to determine and evaluate students' abilities. In this study, there were 2 kinds of tests used, namely: early math ability test (TKAS), mathematical problem solving ability test (TKPMM). The following is a description of each test instrument used. Students' initial ability (KAS) is the mathematical ability possessed by students before learning in this study was carried out. TKAS aims to determine the equality of students' abilities in learning by using probing prompting techniques and conventional learning, besides that it is also used for student placement. TKAS uses instruments that have been tested for validity and reliability.

To classify students into three groups (high, medium, low) grouping criteria are used based on the mean score ($\bar{x}$) and standard deviation (s) according to Arikunto (2012) which can be seen in Table 4.7 and the distribution of students in each class based on KAM can be seen in the table below.

Table 8. Descriptive Statistics of TKAS Data based on the Research Sample Class

Research Class	Sample	Amount	Low ability	Currently	Tall
A (Experiment)		25	4	15	6
B(Control)		25	5	16	4

Mathematical Problem Solving Ability Test (TKPMM)

The purpose of the compilers of the mathematical problem-solving test questions in this study was to measure students' mathematical problem solving abilities (KPPM). The material tested in TKPMM is arranged in the form of a description test consisting of 4 structured questions, consisting of 10 indicators on the questions. The questions given were arranged based on indicators of problem-solving ability in this study, namely: (1) identifying data adequacy to solve problems, (2) making a mathematical model of a problem and solving it, (3) selecting and implementing strategies to solve mathematical problems and or outside of mathematics, (4) explaining and or checking the correctness of answers.

Prior to use, the test questions for mathematical problem-solving skills were first validated by experts consisting of 1 math teacher and 1 colleague after being validated and revised the TKPMM was tested on certain types of statistical tests that fit the problem.

Validity is a measure that shows the levels of validity or validity of an instrument (Arikunto, 2010: 211). The correlation formula that can be used is the Product Moment correlation formula with rough numbers, namely:

$$r_{xy} = \frac{N\sum XY - (\sum X)(\sum Y)}{\sqrt{\{N\sum X^2 - (\sum X)^2\}\{N\sum Y^2 - (\sum Y^2)\}}}$$

(Arikunto, 2012:87)

Information:

rxy : The correlation coefficient between variable X and variable Y, the two variables are correlated
N : The number of subjects per content
$\sum X$: Sum of item scores
$\sum Y$: Sum total score
$\sum X^2$:Sum of the squares of the item scores
$\sum Y^2$: The sum of the squares of the total score
$\sum XY$:The sum of the multiplication of the item score and the total score

After obtaining the price, r_{xy}it is then consulted to the rProduct-Moment critical price table, if $r_{xy} > r_{tabel}$it means valid and vice versa if $r_{xy} < r_{tabel}$it means it is not valid (Arikunto, 2012: 89). With the ten questions that have been tested on 25 students and validated by several experts (validators), the test results of the instrument trials that have been tested to measure the level of mathematical problem solving ability and students' mathematical understanding are presented in the following table:

From the data analysisis, of the 5 questions tested the results turned out to be questions number 1, 2 to 10 valid and at a significant level of 5% so it was concluded that question numbers 1, 2 to 10 were feasible to use.

Reliability is related to trust issues. A test can be said to have a high level of confidence if the test can provide consistent results (Arikunto, 2012: 100). In this study, a reliability test was carried out in the form of a description using the Alpha formula. From the criteria for reliable test data, consult the r table prices in the Product-Moment r Values table, if $r_{hitung} > r_{tabel} \quad dengan \quad \alpha = 0{,}05$ then the instrument is reliable. The results of the instrument trial consisting of 6 questions can be seen in the following table

Table. RESULTS OF TEST DIFFICULTY LEVEL

No. Question	Difficulty Level Coefficient	Criteria
1	0.178	Hard
2	0.548	Currently
3	0.656	Currently
4	0.674	Currently
5	0.467	Currently
6	0.539	Currently
7	0.467	Currently
8	0.511	Currently
9	0.520	Currently
10	0.683	Currently

Arikunto (2012: 226), says that "The discriminating power of a question is the ability of a question to distinguish between smart students (high ability) and stupid students (low ability)". The results of the analysis in all of the tables above show that the TKPMM questions have met the adequate characteristics for use in research. The results of the analysis in table 4.15 show that the TKPM questions have sufficient characteristics to be used in research.

1. Observation, used to get an overview of the atmosphere and quality of the lecture process carried out as well as student activities during the lecture/learning process.

2. Interviews are used as supporting data to complement the results of observations and interviews, as well as evaluation material to determine strengths and weaknesses during the learning process.

The data in this research is divided into quantitative data and qualitative data. Quantitative data was obtained through TKPMM, which was carried out before (pretest) and after (posttest) learning activities. Quantitative data was obtained through the results of student work (answers), observations, photos and videos, as well as the results of interviews with research subjects. In general, data processing and analysis in this study were carried out as follows:

1. Calculate pre-test, post-test and n-gain (increase) descriptive statistics from KPMM and KPM data.

2. Perform statistical prerequisite tests. This is needed as a basis for determining what statistical tests will be used in testing the hypothesis, namely the normality test for the distribution of research subject data and the homogeneity test of variance for each group of data tested.

The data normality test aims to find out whether a data distribution is normally distributed. By knowing the normality of the data, the statistical test used in the sample group will be known. The homogeneity

test of variance aims to determine whether the data group has a homogeneous variance. The hypothesis tested

Discussion

This research was conducted at MA Al-Fatah Palembang with class X2 as the experimental class and class X1 as the control class. This study aims to determine the effect of applying the learning model with the STEAM approach assisted by LKPD and Quizizz on solving mathematical problems for class X MA Al-Fatah Palembang students. Both classes were given a pretest to determine students' initial abilities before being given treatment.

Homogeneity test was carried out to find out whether the pretest data from the experimental and control classes were homogeneous or not. The results of the homogeneity test on students' pretest scores showed that the two samples were homogeneous so that both classes could be used as research samples. The two classes were given different treatment, the experimental class was given treatment by applying the learning model with the STEAM approach assisted by LKPD and Quizizz while the control class was taught as usual.

Learning with the learning model with the STEAM approach assisted by LKPD and Quizizz begins by starting to log in to the Edmodo blended learning class and then joining the group code so that students can see the display on Edmodo made by the teacher, both the material and assignments that have been provided for each meeting. And also the teacher distributes a summary of the material manually so that students can learn in collaboration with their peers.

After getting a HOTS-based contextual LKPD, students carry out discussions in pairs. The teacher facilitates students when there are difficulties in learning. Students are very enthusiastic and motivated in conducting discussions and also in exploring the parts in the LKPD. The class atmosphere became lively with the voices of students, almost all students did well in learning. There are also students who are not used to learning with LKPD. Before the teacher distributes the LKPD according to the STEAM syntax, the students are divided into several homogeneous groups so that it is easier for students to carry out discussions.

After the students worked on the student worksheets, they presented the results of their worksheets in front of the class. The other students listened and corrected mistakes or important or missing parts, and the teacher observed student activities. In the next activity, students exchange roles, students who were originally speakers are exchanged for listeners, and vice versa and the teacher helps students draw conclusions. At the first meeting the material discussed was arithmetic sequences.

Implementation of Cycle I

Cycle I was held on March 1 and 4 2020. March 1, 2020, for the first learning activity. Meanwhile, on March 4, 2020, one hour of study for the final test of cycle I. The implementation of each cycle includes four stages, namely (a) planning, (b) implementation, (c) observation/evaluation, and (d) reflection. The description of the implementation of cycle I is as follows:

1. Planning Stage

At this stage, the following steps are taken:

The teacher determines the subject matter to be taught, namely arithmetic sequences, Designs learning designs as a guide in learning, Forms groups of 4-5 students divided based on attendance sequences, determines problems related to arithmetic sequence material as a means for learning, Develops evaluation tools in end of the meeting to measure student success and Develop and prepare learning observation guidelines for both teachers and students.

2. Implementation Stage

At this stage the basic learning design of arithmetic sequences is carried out in accordance with the learning design that has been made. The activities carried out are:

Opening the Lesson, The things that are carried out in opening the lesson viz

Opening Activities

Presence, Information to be carried out, Providing apperception, Information on objectives to be achieved during learning.

Core activities

The activities carried out in outline are as follows:

a. Teacher Activities

The teacher carries out the lesson to explain the meaning of arithmetic sequences, the teacher distributes questions to groups to solve, observes and guides groups that are experiencing difficulties and discusses the results of the work with students.

b. Student Activities

Pay attention to the explanation given by the teacher. Carry out the task given by the teacher to solve the problem with the group with the steps: one group member reads the problem, makes predictions or interprets the problem by writing down what is known and what is asked, makes an overview or plan for solving the problem, writes the problem solving in detail sort, and revise and edit each other's work (if anything needs to be revised).

c. Closing Activities

Summing up the learning outcomes, Conducting a final evaluation/test of learning. And record homework for each student.

Observation/Evaluation Stage

At this stage, collaborative observations were made by researchers with other teachers to observe and evaluate the learning process, especially the activeness and working methods of students in groups.

Reflection Stage

After carrying out observations during learning in the classroom, then a reflection is held on everything that is done. From observing the teacher's ability to manage classes and groups, the following findings are obtained. The teacher used efficient time in conveying subject matter, in accordance with the allotted time allocation. There was a group that had less heterogeneity, because in that group all were girls. Teachers do not write learning objectives on the blackboard, only stated orally. From observations of students' abilities in learning activities in the classroom, the following findings are obtained.

1. All students are ready to follow the lesson.
2. All students are enthusiastic about working on the questions given by the teacher.
3. There are groups that are not correct in working on the questions
4. Students are quite good at writing ethics on the blackboard.
5. There are groups who lack the courage to respond to the results presented by other groups.
6. There are still group leaders who have not been able to manage cooperation within their groups.
7. Presenters who are representatives of student groups are still awkward in presenting results in front of the class.

At the second meeting the material discussed was material related to problem solving. In this material students are expected to be able to determine unknown numbers from known number patterns. The

results of student summaries show that students are more able to express the essence of the material they read. By using this model, students are given the opportunity to play an active role in groups which are manifested by their roles as speakers and listeners. Students are also trained to be more thorough and be able to express their opinions in correcting the results of the speaker's summary. The activities in this model are like learning from problems found in LKPD and being able to construct the knowledge you have with new knowledge.

When the learning activities took place, both in the experimental class and the control class, data were collected on student activity by observation. Percentage comparison. Comparison of student activity between the experimental and control classes is known from the student observation data taken during the learning activities. From the observation data it is known that the percentage of activeness of the control class students is 52.9% while the experimental class is 79.99% which shows that with the STEAM model assisted by LKPD and Quizizz students become more active in participating in learning activities. Testing for normality and homogeneity of the data obtained was carried out before testing the hypothesis. The normality test is used to determine whether the data is normally distributed or not. The results of the data normality test show that all data is normally distributed because the sig. (Asymp. Sig.) > 0.05. The homogeneity test is used to determine whether the two classes to be studied are homogeneous or not. From the results of the analysis of both pre-test and post-test data, a sig. value of > 0.05 was obtained, so that the two class samples were declared homogeneous. After the data is declared to be normally distributed and homogeneous, the hypothesis test used is the independent sample T-test. Shows that all students with STEAM model lessons assisted by LKPD and Quizizz show a higher KPMM increase than students who get conventional learning, it can be seen from the count > t table, namely 9.78 > 1.71 t-test formula. Assuming that there are differences in treatment of the control class in class X MA.Al-Fatah Palembang students.

Research supports the results of research that has been conducted by (salsabila: 2022) With PBL-STEAM, students also get learning experiences that are interesting, broad, and meaningful, thus enabling an enthusiasm for learning which leads to an increase in student AQ. By (Lestari : 2021) with STEAM the results of the scientific critical thinking skills test increase significance. And by (Nurhikmayati: 2019) the implementation of STEAM in learning mathematics is very useful and useful, not only can it develop abilities in the cognitive aspect, STEAM learning can also develop other abilities and skills that are useful for students to face the challenges of the globalization era in the future.

CONCLUSIONS AND SUGGESTIONS

Based on the data from the results of hypothesis testing, it can be concluded from the results of this study that the increase in the ability to solve mathematical problems of students who receive learning using STEAM assisted by LKPD and Quizizz is better than students who receive conventional learning in terms of the overall and KAM of students.

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