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The Effectiveness of Problem Based Learning Model and Quizizz Application in Improving Learning Outcomes and Motivation

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Abstract

This study aims to identify the influence of the use of problem-based learning models (PBL) combined with the Quizizz application on learning outcomes and student motivation in trigonometry material in class X of SMA Muhammadiyah Pagaralam. This study uses an experimental method with a Pretest-Posttest design Control Group. The research sample consisted of students of class X MIPA 3 as the experimental class and students of class X MIPA 2 as the control class, each consisting of 36 students. Data were collected through test and documentation methods using descriptive questions as instruments. The results of the study showed that students who learned using the Problem Based learning model Learning combined with the Quizizz application has better learning outcomes than students who follow conventional learning. This shows that the innovative learning approach is able to increase the effectiveness of learning in trigonometry material..

INTRODUCTION

Students' difficulties with comparative material trigonometry. Seen in students tend only memorize formulas and less motivated to understand draft trigonometry. Some students Still not able to finish internal question life everyday use the sine and cosine rules. This is because Students are unable to analyze questions and relate them to the form comparison in a right triangle so that the difficulty of the formula trigonometry [1] [2]. Comparative material trigonometry is a difficult material understood students, learners tend to have difficulty in understanding the concept that is considered complicated, abstract and also low understanding and interest learning about trigonometry material [3]. The low results Study can caused by Because lack of ability think to problems that exist in the learning process and understanding of the material [4] [5]. The results of the study based on research [6] SMP Taman Dewasa Ibu Pawiyatan class VIIB in mathematics lessons, found that in the learning process when the teacher explains the material and gives examples of questions only part student pay attention. There are indications students are not interested learning mathematics, students talking to his friend without notice explanation of the lesson material delivered by the teacher, students lack concentration when lesson deadly, and students feel bored in following lessons. When given the teacher has the opportunity to ask questions student tend to be quiet and reluctant to ask what

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they don't understand, therefore it is needed learning using the right models and methods is also fun so that student more like math and also they will more active to follow lesson.

2013 curriculum is a new government policy in the field of education that is expected to be able to answer challenges and problems that will faced by the Indonesian nation in the future [7]. Implementation The 2013 curriculum is effort government for more increase quality graduate of according to the purpose education. Changes This curriculum is expected can produce productive, creative, innovative and affective people through strengthening attitudes (know why), skills (know how), and knowledge (know what) are integrated. This is in order to welcome development life and science knowledge the 21st century is experiencing friction paradigm. Change This curriculum demands change paradigm learning teaching to learning, from teaching community to learning community. Thus, teachers are required to be creative and innovative in designing learning so that students are motivated and feel like during learning taking place. Therefore it must be There is effort from the teacher about How develop learning so that learning is interesting, fun, motivating students to learn independent. To encourage students' ability to produce work contextual, both individual and group so recommended approach learning that produces work based on problem solving [8].

Approach or a learning model that emphasizes student more active one of which is the problem -based model. In accordance with the characteristics the 2013 curriculum as stated in the Ministry of Education and Culture Decree No. 81 of 2013. Students assume that mathematics is a problem so make student passive in learning. One of the efforts to improve ability solving students' mathematical problems is by applying learning models Problem Based Learning, this model is a strategy that involves students in problem solving and learning models is one of the learning models innovative that can give active conditions to students [9]. The learning model (problem based learning) is learning that is centered on students. Problem based learning is designed to help student develop skills thinking, skills problem solving skills intellectually, so that become independent and autonomous learners. PBL is a method learning based on principles that the problem can be used as starting point to get new science, [10] . Problem based learning model is a model that places student develop creativity in solving problems, explaining phenomena, and solve problems in a natural and place student as subject learning [5]. The problem based learning model is learning that allows student can develop skills thinking (reasoning and communication) in solving problems [11] [12] [13].

Problem Based Learning (PBL) is one of the method proper learning developed along with the demands learning in application 2013 curriculum. This is in line with the characteristics of PBL as a method learning constructivist oriented student centered learning that is able to grow soul, creative, collaborative, developing ability think level high, increase understanding will meaning, increase independence, facilitating problem solving, and building team work [14] . Thus effort formulation learning the increase effectiveness implementation 2013 Curriculum [15] [8].

In addition to using learning models, another way that can be used to improve learning outcomes and problem solving is to use effective learning media [16]. One of the media used to improve learning outcomes and problem solving is to utilize technology, namely the Quizizz application. Quizizz is a game-based educational application, which brings multiplayer activities to the classroom that has been created, making practice questions interactive and fun. Mathematics is considered scary and boring, now it is fun because in learning using game- based

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media which contains images, videos and audio [9]. Quizizz is easily accessible via the web. Students are given a game code password, to enter the class where after that students can solve questions that have been created by the teacher. Use of quizizz In learning evaluation, it can be applied to any material. However, in this study, the researcher used trigonometry material [17]. Interesting features of the quizizz application can be used by teachers to help students become more enthusiastic about the learning system. How to access it is that students only open the link quizizz given by the teacher or can be opened on the link https://quizizz.com and enter the game code shared by the teacher. The quiz can be carried out without the help of an LCD and the questions that the teacher has made can be randomized for each student, so that it can minimize students from cheating [18].

METHODS

The experimental research methods are applied For analyze the effect of certain treatments in A condition control [19]. This study uses Pretest- Posttest Control Group Design design. This study examines influence implementation Problem Based Learning (PBL) Learning Model combined with the Quizizz Application to results Study students. The variables in this study consist of of two components main, namely variable free (X) in the form of implementation of PBL and use of Quizizz, as well as variable bound (Y) in the form of results Study students after following learning The research population includes all over students of class X of Muhammadiyah Pagar Alam High School in the 2023/2024 academic year, with samples in the form of two classes that are selected randomly random. One of the classes works as experimental group taught using PBL and Quizizz, while group control taught by method conventional.

Data collection was carried out through documentation and testing. Documentation in the form of photos and videos recording learning activities, while test multiple choice questions double use Quizizz application to measure results Study students on comparative material trigonometry. Before used, instrument test tested validity, reliability, level difficulties, and power different. Validity test results shows all the questions are fulfilled criteria with r-count > r-table and significance < 0.05. Reliability counted use Alpha formula, with value Cronbach's Alpha > 0.60, indicating that instrument classified as reliable. All questions also show level difficulties tall as well as Power good difference.

Data analysis was carried out in several stage. Documentation data analyzed to provide learning process overview teaching. Test data analyzed through normality test using chi- square to ensure normal data distribution, and homogeneity test to ensure Variants second group homogeneous. Furthermore, hypothesis testing was conducted using the Paired Sample T-test. The results of the analysis show difference significant between pretest and posttest results in the experimental class, as well as difference significant between the experimental and control classes, with a value of Sig. < 0.05, so hypothesis alternative (H1) is accepted.

This research provides proof empirical that implementation Problem Based Learning Model combined with Quizizz Application effective increase results Study students on comparative material trigonometry. This finding supports importance use of learning models innovative based on technology to improve quality education, especially in mathematics lessons. This research can also become reference for educators and institutions in developing method relevant and interesting learning.

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RESULTS AND DISCUSSION

Implementation of Trigonometry Learning Research with PBL and Quizizz Models

At the first meeting in the experimental class X IPA 3, the activity began on February 19, 2024 with a pre-test consisting of 5 questions. Researchers open learning by greeting, introducing yourself, and check presence students. After the pre-test was distributed, students given time to complete the questions as the basis for knowing their initial abilities. This pre-test becomes first step to measure effectiveness application of learning models Problem Based Learning (PBL) supported Quizizz application.

The second meeting, implemented on February 21, 2024 during three hours of lessons. Researchers convey objective learning and benefits study comparative material trigonometry, especially in life everyday. Students then Student Worksheets (LKPD) are distributed which contain problem contextual to understand draft comparison trigonometry. This process encourages students to search information and solve problems collaborative. Researchers are also actively helping students who experience difficulties, one of which is by explaining connection right triangle with trigonometry material, using illustration simple like a pole picture flag.

Quizizz application was introduced at the stage reflection learning. Researchers explain method access applications, from login to solve the available questions. Some student had time experiencing technical difficulties such as logging into the application, but after being directed, they can use application smoothly. Quizizz provides experience interactive and fun learning Because student can see score they directly after answering the questions. This activity increases enthusiasm and motivation Study student.

The third meeting on February 23, 2024 was used to conduct the post-test. The researcher provide essay questions based on comparative material trigonometry to measure achievement results Study students after the implementation of the PBL and Quizizz models. On the other hand, in the control class X IPA 2, the learning process was carried out in a conventional method lecture without use technology. Although student given the same material, the approach used different so that The pre-test and post-test results of both classes were compared to find out effectiveness the methods applied.

Data analysis shows that learning with the Quizizz- based PBL model is more effective compared to method conventional. The results of the pre-test and post-test were processed using normality and homogeneity tests. ensure data validity. With the value Kolmogorov-Smirnov significance in the pre-test of the experimental class was 0.200 and the control class of 0.155 (both > 0.05), can concluded that the data is normally distributed. Meanwhile, the homogeneity test show sig value. 0.427 (> 0.05), indicating that the data for both classes are homogeneous. By overall, learning innovative PBL based and Quizizz provides impact positive on results Study student.

Based on the results of the analysis of the post-test data using the t-test, t = 4.078 was obtained with the test criteria rejected Ho if the value t_{tabel}> then it is rejected and Ha is accepted. It can be seen from the value of 4.078 > 2.030, it is clear that Ho is rejected and Ha is accepted. So it can be concluded that there is an influence of the use of the t_{hitung}problem-based

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learning model learning and quizizz application on student learning outcomes in trigonometry material in class X of SMA Muhammadiyah Pagar Alam in the 2023/2024 Academic Year.

After looking at the two groups that received treatment, the average for the group that used the problem-based learning model was obtained. learning and quizizz application of 80.06 and the average for groups that did not use the problem based learning model learning and quizizz application as much as 70.58. It turns out that the average group the experiment was greater than the control group, with a difference of 9 as seen in the pie chart below.

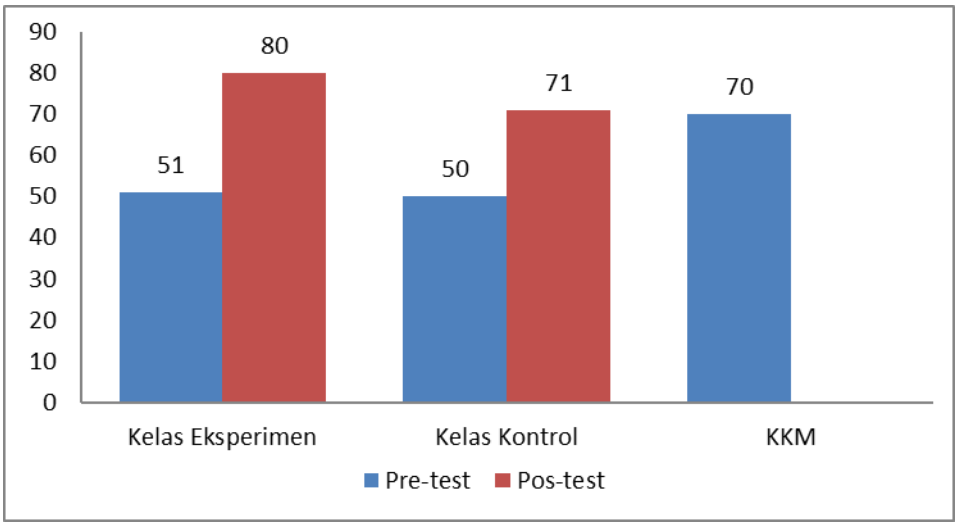

Figure 1. Bar Chart of Student Test Results

Based on description above so can concluded that teachers can using a learning model problem based learning and applications quizizz Because with using a learning model problem based learning and applications quizizz student more focus in learning and teaching, students more easy understand material comparison trigonometry as well as student more active, students more conducive Because student enthusiastic in do questions in the application quizizz. However, in learning using a learning model problem based learning and applications quizizz there is constraint namely the lack of time learning because at the time researcher start learning lots tools that must be prepared like infocus, laptop and speaker

Discussion

Based on the results of the description of the implementation of learning in the experimental class which has been carried out using the problem based learning model learning. Where are the steps of the problem based learning model? learning, namely problem orientation, organizing students, guiding group investigations, developing and investigating problems as well as evaluation and analysis [19], [20], [21], [22], [23]. First, the teacher asks students to pay attention to the existing problems, then students are asked to gather in their respective groups. each with a group consisting of 6 groups of 6 people. The teacher invites students to investigate and also look for information in the textbook. Then the teacher encourages students to discuss with their group members about strategies in finding answers to existing problems by having to understand what is known from the steps in the student's LKPD about trigonometric

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comparison material and determining angles, angle names. So that they can get the formula obtained from the problems in the LKPD can be solved, exchange opinions and discuss with group members about the information available to get an explanation of problem solving [24], [25]. The teacher helps students in conducting investigations, the teacher provides an explanation by asking students to read the instructions in the LKPD of each group and the teacher provides direction when there are questions from each group. They conduct experiments, 2 students understand the problems in the LKPD, 2 students observe the same object to determine the angle, 2 people look for information about the comparison material in the student's textbook.

After all, students are able to find solutions to the problems they have done and get the formulas they found from the experiments. The group that has finished will present the results of the discussion obtained. The other groups listen and pay attention to the results of the group that is presenting, and so on. After students understand and solve problems about the concept of trigonometric comparisons. Only then do researchers conduct quizzes on the quizizz application, where the quizizz application is a game- based educational application, which brings multiplayer activities to the classroom that has been created, making practice questions interactive and fun where researchers created 10 multiple-choice questions.

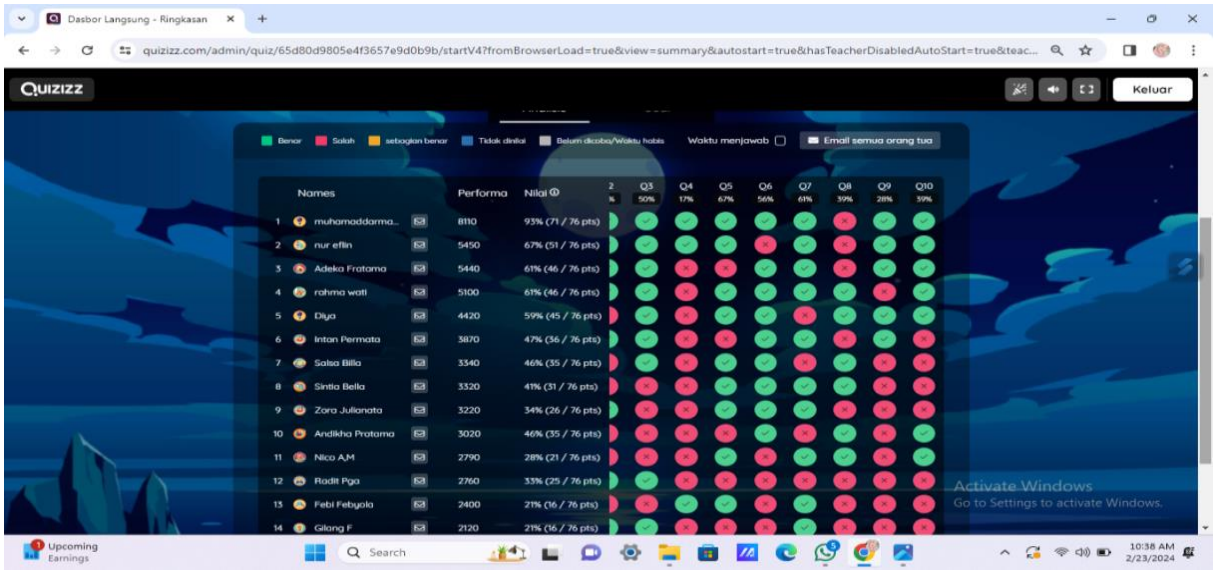

Figure 2. Test Results Using the Quizizz Application

The Figure 2 shows there are 30 students who took the test, in the picture above the researcher can find out the scores that have been obtained by the students, where if the green image and check mark means that the questions worked on by the students are correct and if the red mark and cross mark means wrong. So it can be concluded that with the quizizz application can increase student enthusiasm because students are more active, creative and the class becomes conducive because of the game in learning.

After the researcher implemented learning using the Quizizz application, the results of the research test (post-test) given by the researcher showed that many students were able to answer the post-test questions. and some other students still do not understand or do not understand yet, as can be seen from the students' answers to the post- test questions.

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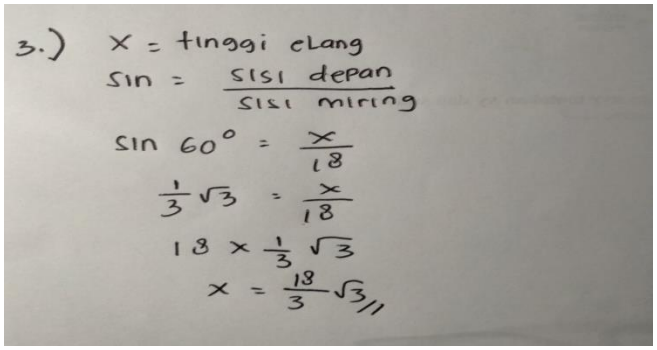

Figure 3. Student Answers

Figure 3. swhos the answer no. 3, there are some students who are still wrong in solving trigonometric comparison problems, the cause is because there are students who are still mistaken about the stages in solving trigonometric comparison problems. In the answer above, the student is still wrong in determining the special angle of 60 degrees and also in solving the root value, that's why the results obtained by the student are not quite right.

The findings of this study indicate that the Problem Based Learning (PBL) model combined with the Quizizz application significantly improves students' learning outcomes and motivation in studying trigonometry. The experimental class, which implemented PBL and Quizizz, demonstrated a higher level of engagement and understanding of the material compared to the control class, which followed traditional teaching methods. This suggests that the interactive and student-centered nature of the PBL model, paired with the gamified features of Quizizz, fosters a more effective learning environment.

The use of PBL encourages students to actively participate in problem-solving and critical thinking processes, which are essential in mastering complex topics like trigonometry. Meanwhile, Quizizz adds an element of fun and interactivity to the learning process, allowing students to assess their understanding in a non-threatening, engaging manner. These features not only enhance comprehension but also increase students' intrinsic motivation to learn, as they feel more involved and in control of their learning journey.

Furthermore, the combination of these methods provides a holistic approach to teaching, addressing both cognitive and affective aspects of learning. While PBL develops analytical and collaborative skills, Quizizz appeals to students' enthusiasm and competitiveness, creating a balanced and dynamic classroom experience. The results of this study underscore the potential of integrating innovative teaching strategies and digital tools to improve educational outcomes, especially in challenging subjects like mathematics.

CONCLUSION

Study of the use of learning models based on supported problem-solving (PBL) Quizizz app shows that This approach is more effective in increase results Study students on the material trigonometry compared to with learning traditional. Students who study with PBL and Quizizz methods show understanding more concept good and involvement active in the learning process. This model does not only help student in finish problem in a way independent, but also improve motivation Study through pleasant interaction use technology. With Thus, the method learning

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PBL based equipped with Quizizz application can become a better alternative effective in increase quality learning and results Study student compared to with method conventional.

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