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Application of Problem-based Learning Models Assisted By Liveworksheets Towards Students' Mathematical Creative Thinking Ability

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Abstract

The ability to think creatively mathematically of students is relatively low. The purpose of this research is to determine whether employing the Liveworksheets-assisted Problem Based Learning technique influences students' mathematics ability to think creatively. This study used quantitative research methods and a non-equivalent post-test only control group design. The sampling technique employs non-probability sampling. The sample for this study consisted of two classes with 71 students. The normality and homogeneity tests are used in quantitative research as part of the preconditioning test. In this study, the hypothesis was tested using an independent sample test. This study's findings illustrate students' mathematics creative thinking ability in experimental classrooms influenced by the usage of the Problem Based Learning model using liveworksheets. This demonstrates that the experimental class's students have a greater potential for mathematical creative thinking ability than the control class. The application of problem based learning models assisted by liveworksheets influences the student's mathematical creative thinking ability.

Keywords: Problem Based Learning, Liveworksheets, Mathematical Creative Thinking Ability

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INTRODUCTION

Because of the fourth industrial revolution in information and technology, life is advancing at an exceedingly fast pace. This proves that skills to keep pace with the rapid development of science is also rapid pace of technology need to be done for balance to occur (Siahaan, 2020). One of the abilities that need to be mastered in this revolution is mathematical creative thinking skills (Barak, 2017). Each skill has its own innovative achievements and can enter different stages of thinking skills, allowing each person to unravel problems in a different way (Liu et al., 2015). Related to the capacity for creative mathematical thought because the advancement of research and development requires special attention, and the capacity for creative mathematical thought (Leikin & Pitta-Pantazi, 2013).

The process of learning to research knowledge so that one may answer issues with various ideas is meant by the term creative mathematical thinking. The student's ability to think creatively about mathematics refers to his or her aptitude to learn new ideas and approaches to solving mathematical problems (Noer, 2013). It is maintained that the capacity to think creatively mathematically is characterized as the process of learning to study in-depth knowledge through observation, experience, and communication to solve issues with actual,

unique actions and new ideas (Amirulloh et al., 2020). Similarly, proficiency or ability in solving mathematical cases using some logical solution according to the real world (Kozlowski et al., 2019). In addition, it is explained in mathematics where the delivery of new thoughts or knowledge will have a scope of elements of clarity, originality, flexibility, and fluency (Ancient &; Andhany, 2018).

Indicators of mathematical creativity described by Sumarmo (2012) are divided into four, namely: 1) Fluency: students can provide many ideas, analysis results, suggestions, and ways to solve problems, 2) Flexibility: Students can generate ideas, alternative answers or solutions that vary. 3) Originality Learners can create different ways to give answers 4) Elaboration: By learning detailed procedures, learners can find deeper meaning in problem solving (Sumarmo, 2012).

The significance of students' abilities to think creatively and mathematically when addressing challenges. State that these skills are mandatory for learners to compete globally (Nurani Dewi et al., 2017). The ability to think mathematically and creatively is also important in solving mathematical problems to achieve educational goals (Nurulaeni &; Rahma, 2022). According to the findings of research on students' creative thinking skills, 12.88% fell into the (Meika & Sujana, 2017). This is supported by a study finding that students' creative thinking capacity was 18.18% (Putra, 2018). Many studies, on the other hand, highlight efforts to increase various learning methodologies or models are used to assess students' creative mathematical thinking abilities (Yu et al., 2015).

The Problem Based Learning (PBL) model involves ways or patterns of thinking that are based on real solutions. To be able to implement mathematical issues in everyday life, the process of adopting PBL is hard (Assegaff &; Sontani, 2016) . Learning that takes an approach is centered on students solving mathematical problems so that they can apply them in real life both individually and in groups (Nagarajan &; Overton, 2019). The learning model's goal is to improve the true concept of an issue. The component years included in PBL include a) learning problems at the beginning, b) utilizing real problems that are around, (ill-structured), c) focusing on multiple perspectives or various perspectives (multiple-perspective), d) problems in new learning domains, e) independent learning, f) variety of resources, and g) emphasizing collaborative, communicative and cooperative learning (Amir, 2015).

Syntax of the Problem Based Learning Model (Ariyana et al., 2018): The First Stage, directing problems to student In other words, the teacher explains the learning objectives, an explanation of the logistical needs (tools and materials) required to unravel the issue, and motivates students to unravel the problem of their choice. The second stage, accommodating students to learn, where the teacher helps students determine learning tasks. Leading an investigation group, where the teacher invites learners to collect information about the problem, and runs experiments on previously collected problems to get a solution to the problem. The fourth stage, Develop and present the results that have been researched, namely teachers can accommodate students to prepare and plan the results to be achieved from the tasks given in the form of reports, videos, and models. Fifth Stage, Analyze and evaluate problem solving. That is, teachers can help students assess the results of problem-solving surveys and complete learning procedures.

The learning process is a team effort involving teachers and students. This is reinforced by the statement that the occurrence of social processes or contacts between teachers and students on certain material with learning models or methods can increase the ability to think creatively and mathematically (Prananda et al., 2020). The advantages of the PBL model can solve mathematical problems in everyday life (Juliawan et, al., 2017). This states that the PBL approach may boost student involvement to solve an issue. It is no different from the statement that the PBL model can solve these mathematical problems that focus on students (Indarwati et al., 2018). Hence, to progress the capacity to think inventively numerically, intuitive learning must be utilized within the learning handle (Subakti dkk., 2021).

Liveworksheets are learning media obtained to help the process of technology-assisted learning activities. It is stated that it is a learning support carried out to channel messages to achieve learning objectives. With the help of these media can maximize learning success (Lathifah, 2021; Ermiana et al., 2020; Arifin & Aprisal, 2020) Liveworksheets is a forum that can be applied by teachers in providing an interesting problem because it is supported interactively with various sound, writing, and video features (Khikmiyah, 2021). Furthermore, the adoption of interactive LKPD can inspire students to participate more actively and study without being constrained by limitations on time (Prastika, 2021; Sele, 2022). Benefits Liveworksheets can present an attractive assessment model, increasing the ability of students can be useful, especially in the field of technology, increasing interest with its attractive appearance, and being able to ease the task of checking the results of student work.

Some relevant research is on mathematical problem-solving skills in comparing Liveworksheet and Quizizz. Prove that using Liveworksheet is better than Quizizz to improve the way of thinking. Furthermore, the research from Azzahra & Kowiyah (2022) demonstrates that the use of the PBL model with the assistance of videos in the liveworksheet menu is beneficial with intermediate category achievement. This finding describes that video-based learning on liveworksheets can develop mathematical problem solving Supported by Student Worksheet research with the use of liveworksheets in conducted by Aryani, said that the application (Haqiqi & Sharifa, 2021). Liveworksheets-assisted PBL models have an influence on the mathematical representation ability of students compared to the use of Google Classroom (Aryani et al., 2021).

Based on past research explanations, where there is a resemblance, particularly the usage of PBL models aided by liveworksheets. The distinction focuses on the concept of pupils' mathematical creative thinking abilities. This study was undertaken on students because there was no previous research on applying problem-based learning models aided by liveworksheets to students' creative thinking abilities.

Based on the above description, the researcher is interested in investigating the use of the liveworksheets website to create interactive liveworksheets in schools. The goal of this study was to see if using problem-based learning models with worksheets had an influence on students' mathematics creative thinking ability.

METHOD

The methodology utilized in quantitative research trials uses a kind of Quasi-Experimental Design and nonequivalent posttest-only control group design techniques. Two classes are tested, an experimental class and a control class, each receiving a different study treatment. The experimental class teaches the application of PBL models supported by Liveworksheets. However, the control class does not receive a live worksheet that is supported by PBL. Design Figure 1. The following demonstrates the design of the Nonequivalent Posttest-Only Control Group (Sugiono, 2017):

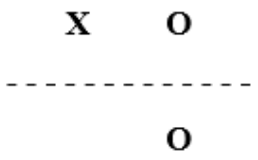

Figure 1. Design Research

Information:
X: Application of Problem-Based Learning Models with Liveworksheets
O: Posttest the student's mathematical creative thinking ability.

This study's population comprised of five classes of students in class VIII SMP.The sampling technique employs non-probability sampling. The sample of this study involved two classes totaling 71 students. Control class VIII MIPA 2 with 35 students and experimental class VIII MIPA 4 with 36 students.

The following stages are taken in this study: 1) Create research instruments in the form of description questions to assess students' mathematical creative thinking skills. 2) Instruments are given to students. 3) Conduct validity and reliability tests. 4). Prerequisite test i.e. normality and homogeneity test. 5) Using SPSS for Windows version 25, test the hypothesis that this is an independent-sample t-test on only normal, heterogeneous data at the 5% significance level.

Data collection results and validity calculations for instrument effectiveness testing. In Table 1.

Table 1. Validity Test Results

Item	Person Correlation	Sig	Result
1	0.596	.000	Valid
2	0.628	.000	Valid
3	0.327	.021	Valid
4	0.520	.000	Valid
5	0.639	.000	Valid
6	0.449	.001	Valid
7	0.475	.000	Valid
8	0.564	.000	Valid

The results of data collection Table 1. in calculating the validity for testing the effectiveness of the instrument value of a Sig. < 0.05 then all items are declared valid. Furthermore, reliability tests to measure consistent results on student instruments are listed in Table 2.

Table 2. Reliability Test Results

Reliability Statistics	
Cronbach's Alpha	N of Items
.635	**8**

Based on Table 2. The results of the test reliability coefficient analysis of the devices tested showed the correlation coefficient results of the reliability test of the student's mathematical creative thinking ability 0.635 > 0.60. So it can be concluded that the test is a reliable instrument, so it can be used as a measuring instrument.

RESULTS AND DISCUSSION

This research was conducted after the findings of the instrument test had been determined to be valid and reliable. Data from respondents can be explained in Table 1.

Table 1. Description of Statistics

Descriptive Statistics	Class	
	Experimental	Control
N	35	36
Range	19	26
Minimum	12	0
Maximum	31	26
Mean	25.11	15.22
Std Deviation	4.13	6.68

Based on Table 1, the experimental class was 35 students, while the control class was 36 students. The average, maximum, and minimum values of the experimental class are greater than those of the control class. A larger control class standard deviation means values on

different items, while a smaller experimental class means values on similar items. The results of the normality test are shown in Table 2.

Table 2. Normality Test Results

Test Of Normality	Sig.
Eksperiment Class	.120
Control Class	.147

Based on Table 2 the experimental class significance value 0.120 > 0.05 and the control class significance value 0.147 > 0.05, so the conclusions of both classes came from normally distributed data. Then the data utilized in this investigation are normally distributed. The finding of is homogeneity reported in Table 3.

Table 3. Homogeneity Test Results

Test of Homogeneity	Sig.
Levene Statistic	.005

According to Table 3. the test result "Test Of Homogeneity Of Variances" shows that the significance value is 0.005 If the value is 0.005 < 0.05, the ground for decision-making in the homogeneity test is not homogeneous. The comes about of the speculation test After the normality and homogeneity tests have been carried out, the t' can be continued in Table 4.

Table 4. Independent Sample Test Results

Independent Sample T-Test	Sig.
Equal Variances Not Assumed	.000

The results are presented in Table 4. to determine whether the change is substantial (original), output from the "Independent Sample Test". Based on Table 6 in the section "Equal Variances Not Assumed" significance value 0.000 < 0.05 is obtained, it is confirmed that H_0 is rejected in the independent sample t-test, and is recognized as the foundation for decision making, This demonstrates that the use of the PBL paradigm supplemented with live worksheets influences students' mathematical and creative thinking skills.

Learning procedures are carried out in experimental classes and control classes. The experimental class did PBL syntax learning while the control class did not do PBL syntax learning. In the experimental class, the first meeting is to inform learning objectives, and information about Liveworksheets media in learning support and conduct learning discussions about webs to build flat side spaces with props and liveworksheets. During the meeting, the two students discussed the elements that exist in building a flat-side room using teaching aids. The surface size of constructing a flat side room featuring instructional films in Liveworksheets was considered at the third and fourth sessions. The volume of constructing a flat side room holding instructional films in Liveworksheets was considered at the fifth and sixth sessions. Using instructional films, the seventh and eighth meetings explored the combined flat side space's surface area and volume.

The application carried out in the control class is that at the beginning of learning, motivation is given, by seeing and observing reading materials related to building polyhedral material. Learners form several groups to discuss, collect information, and re-present related to the notion of building a flat-side space. After making a presentation, the other group responded to the results with group discussion. Furthermore, the results of discussions conducted by the entire group were concluded by teachers and students regarding the understanding that occurred in the material. Meanwhile, the application of the PBL demonstrate carried out within the experimental lesson is the primary organize, informing related to learning objectives, providing motivation, preparing tools and materials, and solving problems centered on students by observing concrete objects that exist build flat side space. Through liveworksheets learners group images to polyhedral of cubes, cuboids, prisms, and

pyramids. The second stage is solving math problems on the liveworksheet by discussing them with the group. The third stage is the use of liveworksheets in which there are learning videos related to the material and there are concepts, as well as examples of problems that use daily life as a reference to make students more involved in mathematics learning and create a flat space in the process of mathematics learning. The fourth step is to deploy the results of solving the resolved problem. The fifth stage, the assignment using liveworksheets has been completed, and the evaluation of the final results.

The mean difference between experimental and control classes is an intriguing component of this study. Applying PBL models to creative thinking skills affects mean scores in control and experimental classes (Ramadhani & Khairuna, 2022). This is backed up by the fact that students' learning outcomes improve when using Liveworksheets learning media (Prabowo, 2021). This is backed up by the fact that students' learning outcomes improve when using Liveworksheets learning media. This shows that the experimental class means are greater than the control class means when using the PBL model assisted by liveworksheet.

CONCLUSION

This study was conducted to investigate the impact on students' creative thinking ability of applying a PBL model supported by liveworksheets. Based on our PBL model findings, the supported liveworksheet averages are higher. This shows that using a PBL approach supported by liveworksheets has an impact on students' mathematical and creative thinking abilities.

RECOMMENDATIONS

Further research suggested using interactive worksheets-assisted PBL models for different mathematical skills and different materials.

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