

The effectiveness of PBL and PjBL assisted *kahoot* learning models on student learning outcomes

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ABSTRACT

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Keywords: Problem Based Learning (PBL), Project Based Learning (PjBL), Kahoot, and Learning Outcomes

The purpose of this study was to determine the effectiveness of problem based learning (PBL) and Project Based Learning (PjBL) models with the help of Kahoot media on student learning outcomes. The sampling technique used was cluster random sampling. Three classes were obtained, namely X ELIN as the experimental class 1, X RPL 2 as the experimental class 2, and X RPL 2 as the control class. Data collection techniques using observation, tests and documentation. The results showed (1) there were differences in student learning outcomes who received the Kahoot-assisted problem-based learning (PBL) learning model, Kahoot-assisted Project Based Learning (PjBL) and conventional classes; (2) the learning outcomes of students who received the problem based learning (PBL) learning model with the help of kahoot were better than the class that received the conventional learning model; (3) the learning outcomes of students who received the project-based learning (PjBL) assisted kahoot learning model were better than the class that received the conventional learning model; (4) the learning outcomes of students who get the Problem Based Learning (PBL) learning model with the help of kahoot and Project Based Learning (PjBL) with the help of kahoot achieve mastery individually and classically.

Introduction

Mathematics is one of the basic sciences that plays a role in improving the ability of the nation's next generation through the development of mindset and reasoning power (Jana, 2018; Jana & Sugiyarta, 2018). Mathematics lessons are taught at all levels of education ranging from elementary, junior high, high school to university. Mathematics is also applied in everyday life. One of the objectives of learning mathematics is that students are able to solve problems which include the ability to understand problems, design mathematical models, complete models, and interpret solutions obtained (Effendi, 2012). Mathematics is a subject that is useful for solving various kinds of problems in everyday life, especially those related to calculations.

In general, the learning process of Mathematics in the dominant class is centered on the teacher. Currently, most teachers teach Mathematics still using conventional methods

(Gunantara, 2014). The learning that is currently happening is learning that is too broad which results in too much material being taught. So that the delivery of knowledge material is only an activity of transferring knowledge, which means the teacher only transfers knowledge to students without paying attention to whether students understand or not the knowledge provided. The learning process is only one-way, making students only imitate and record how to solve problems that have been taught by the teacher (Nurhajati, 2014).

Based on observations, the facilities and infrastructure for supporting learning at SMK Muhammadiyah 04 Sukorejo are adequate, namely the availability of LCD projectors in the classroom. But the use of media as teaching materials when learning is still very lacking. This is evidenced that when the learning process is in progress rarely use learning media, even though using learning media only uses powerpoint. Information obtained that the lack of understanding of students in learning mathematics resulted in low student learning outcomes. From the results of observations obtained information that learning outcomes in mathematics are still below the average, most students still get scores below the KKM (Minimum Ketutansan Criteria) which is 70.

In connection with the low student learning outcomes, it is necessary to design interesting learning models and media, where students can learn innovatively and cooperatively, students can freely ask questions and express opinions. One of the student-oriented learning models is the problem-based learning (PBL) model and the project-based learning (PJBL) learning model. Problem-based learning is problem-based learning, which is one of the best models of modern constructivist learning environments (Savery and Duffy, 1995). Basically, PBL is an educational method in which students develop critical thinking and problem-solving skills, in addition to developing an understanding of important concepts through analysis of the reality of the problem (Duch, 1995). The Problem Based Learning model will also build meaningful new knowledge. The learning model is also a place for students to be able to develop critical thinking and higher thinking skills (Gunantara, Suarjana, & Riastin, 2014). In addition to using problem-based learning, researchers also use project-based learning or can be called Project-Based Learning. Project Based Learning (PBL) is a social practice in which students are socialized through a series of group activities involving simultaneous learning of language, content, and skills (Slater, Beckett, & Aufderhaar, 2006). PBL is also an "approach" to teaching that teaches curriculum concepts through projects" (Bell, 2010, p.41).

So students can try to do better, the researchers conducted learning with online-based games, namely kahoot (Ren & Wagner, 2016). This learning media motivates students to be more enthusiastic in learning. Kahoot is an online application where quizzes can be developed and presented in a formal "game-show" type. Points are awarded for correct answers and participating students will immediately see the results of their responses. Game-based learning has the potential to be an effective tool for learning because it stimulates visual and verbal components (Woo, 2014). (Byrne, 2013; Cross 2014; Kahoot!, 2014; Thomas, 2014) in Santi Novita (2019) Kahoot is a student response system through games made up of quizzes, discussions, and impromptu surveys.

Based on the description above, researchers are interested in conducting a research in the hope of making a meaningful contribution to learning at SMK MUHAMMADIYAH 04

SUKOREJO with a research entitled: "The effectiveness of *problem based learning* (PBL) and *project based learning* (PjBL) assisted *kahoot* learning models on student learning outcomes"

Research Methods

The research was conducted at SMK Muhammadiyah 04 Sukorejo in class X RPL I, X RPL II and X ELIN in the odd semester of the 2020 academic year. The type of research carried out was experimental research. The research design used is Quasi Experimental Design. Quasi Experimental Design was chosen because to overcome the difficulty in determining the control group in the study. (Sugiyono, 2015)

The group that was given treatment was called the experimental group and the group that was not treated was called the control group (Sugiyono, 2015). In the research, the first class as the experimental group I was treated with the Kahoot-assisted Problem Based Learning (PBL) learning model and the second class as the second experimental class was treated with the Kahoot-assisted Project-Based Learning model.

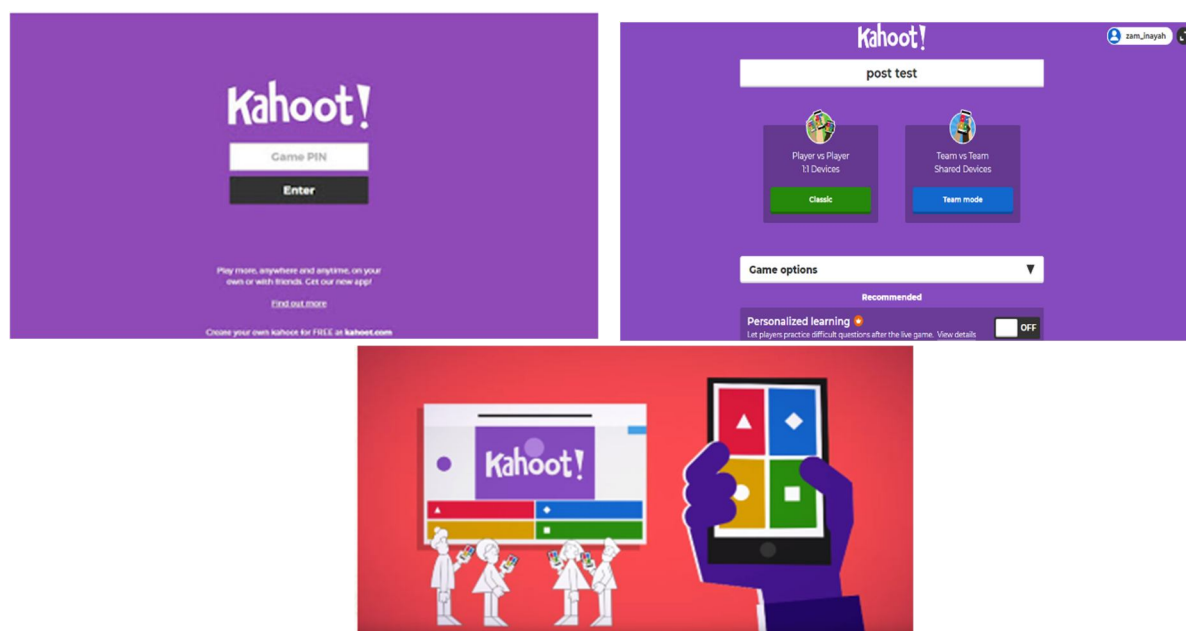


Figure 1. Kahoot Layout

Collection methods used are test, observation, and documentation methods. The instrument used in this study aims to determine student learning outcomes, using the Kahoot-assisted Problem Based Learning (PBL) learning model and the Kahoot-assisted Project-Based Learning (PjBL) learning model. The instrument used is a test containing description questions in mathematics learning on the subject of Absolute Values.

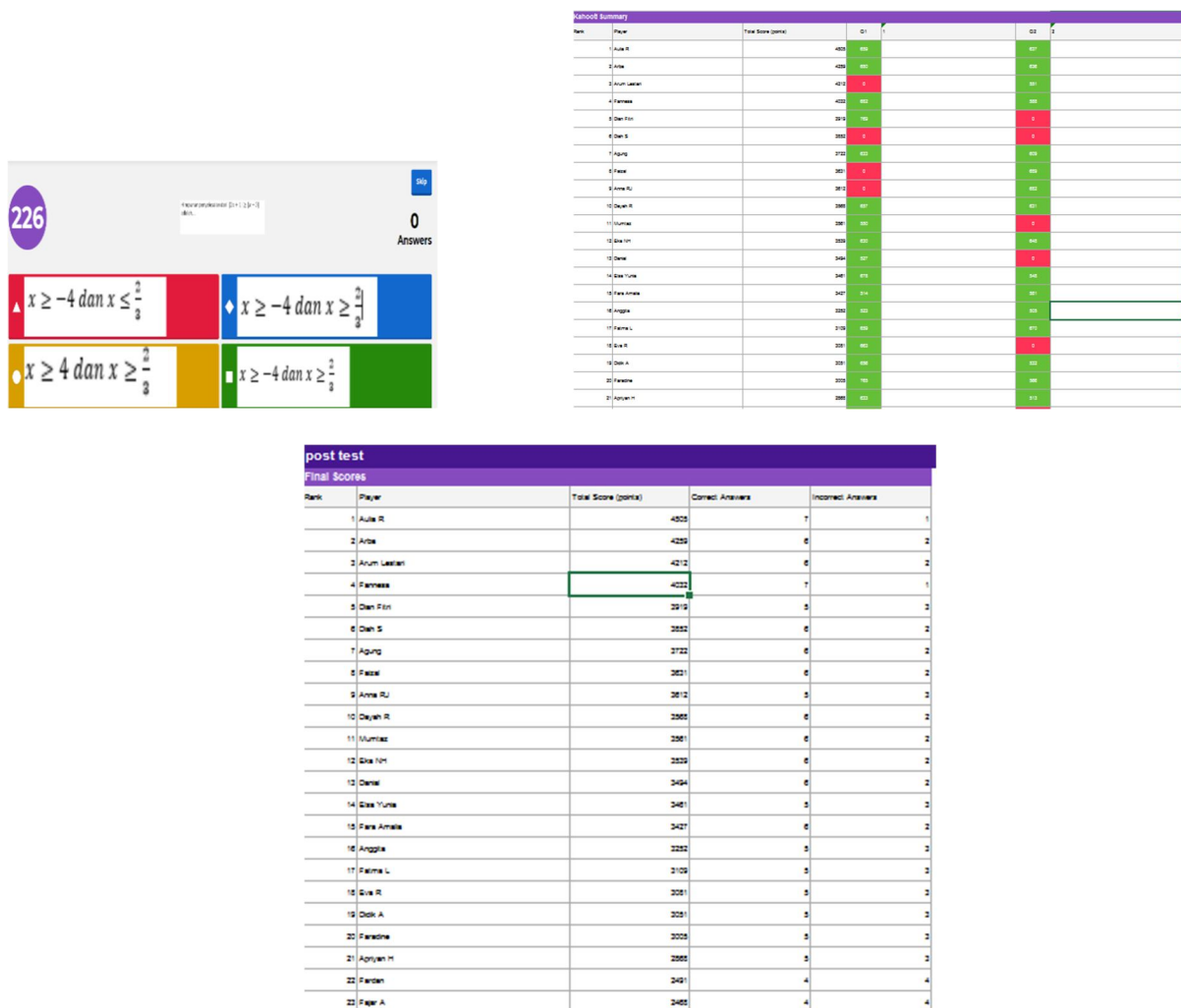


Figure 2. Test Lay out in Kahoot

Results and Discussion

The results of the study were in the form of student learning outcomes data on learning. The research data were obtained from three sample classes which were part of the population of class X SMK Muhammadiyah 04 Sukorejo. Class X ELIN as the experimental class I consisting of 14 students. Class X RPL I as the experimental class II consisting of 23 students, and class X RPL II as the control class consisting of 24 students. The control class uses learning as usual, namely conventional learning, the experimental class I uses the Problem Based Learning (PBL) learning model and the experimental class II uses Project Based learning (PjBL).

Tabel 1
Final data normality test

Class	n	L_0	L_{tabel}	Conclusion
Experiment 1	14	0,201	0,227	Normal
Experiment 2	23	0,166	0,180	Normal
control	24	0,173	0,177	Normal

Before analyzing the data using the t test, prerequisite tests were first carried out in the form of normality tests, and homogeneity tests. Normality test was conducted to find out whether the sample came from a normal distribution or not. The statistical test used is the Liliefors test with a significance level of 5%, the results are as follows: Based on the results of the normality test in the table above, it is evident that each cell is normally distributed. From table 4.5 the normality test in the experimental class 1 obtained $L_0 = 0,201 < L_{table}$, the experimental class 2 obtained $L_0 = 0,166 < L_{table}$, and the control class obtained $L_0 = 0,173 < L_{table}$. From the table, it can be seen that the L_0 of the experimental class 1, the experimental class 2 and the control class are each less than L_{table} , which means that at a significance level of 5% the null hypothesis of the three groups is accepted. So it can be concluded that the experimental group 1, experimental group 2 and control came from a normally distributed population.

Homogeneity test was conducted to find out whether the samples were taken from homogeneous population or not. The homogeneity test was carried out using the Bartlett test, with a homogeneous test decision if $X^2_{hitung} < X^2_{table}$ at a significance level of 5% obtained:

Table 2
Homogeneity Test of Final Data

Class	χ^2_{count}	χ^2_{table}	Conclusion
Experiment 1			
Experiment 2			
Control	1,345	5,991	Homogeneous

From table 2 the results of the homogeneity test analysis $X^2_{count} = 1.345$ and $X^2_{table} = 5,991$ it can be concluded that $X^2_{count} < X^2_{table}$ means that the three classes have the same variance (homogeneous). Then a one-way ANOVA test was conducted to determine whether or not there was a difference in the students' initial average ability from the three sample classes after being given treatment. Here is a one-way anova test table.

Table 3
One-way ANOVA Test

source	JK	DK	RK	F count	P-value	F table
Model	1250,52	2	625,259	4,85205	0,011261	3,155932
Error	7474,169	58	128,865			
Total	8724,689	60				

From table 4.10 the results of the one-way ANOVA test analysis path $F_{obs} > F_{\alpha}$ i.e. $4,852 > 3.156$, then H_0 is rejected, meaning that there is an average difference between experimental class 1, experiment 2, and control or the average of the three groups is not the same. Because from the ANOVA test there was a result that the average difference between the three groups was not the same, then a post ANOVA test was carried out using the Scheffe' method from the Scheffe' test obtained:

1. Between experimental class 1 and control class
With $F_{table} = 3,156$ and $F_{count} = 5.8106$. Because $F_{count} > F_{table}$ then H_0 is rejected, meaning that the learning outcomes of students who get the Problem based Learning (PBL) learning model with the help of kahoot are better than the class that gets conventional learning models.
2. Between experimental class 2 and control class
With $F_{table} = 3.156$ and $F_{count} = 7.8962$. Because $F_{count} > F_{table}$ then H_0 is rejected, meaning that the learning outcomes of students who receive the Project based Learning (PjBL) learning model with Kahoot-assisted are better than classes that receive conventional learning models.
3. Between experimental class 1 and experimental class 2
With $F_{table} = 3.156$, $F_{table} = 0.0075$. Because $F_{count} > F_{table}$, H_0 is accepted, meaning that the learning outcomes of students who get the Problem based Learning (PBL) learning model with the help of kahoot are as good as the class that gets the Project Based Learning (PjBL) learning model.

Then the one-party proportion test is carried out. Where the test is used to determine the completeness of learning both classically and individually. In the following, individual learning completeness is presented in the experimental class 1 and experiment 2.

Table 4
Individual learning completeness

Class	Number of student who completed	The number of student who did not complete	Total students
Experiment 1	10	4	14
Experiment 2	19	5	23

Based on the calculation of the experimental class 1 the value of $t_{count} = 2.015$ while $t_{table} = 2.0$ so that $2.015 > 2.0$ it can be concluded that the average student learning outcomes of the experimental class 1 are more than 70. For the experimental class 2 obtained $t_{count} = 3.583$ while $t_{table} = 2, 0$ it can be concluded that the average student learning outcomes of experimental class 2 are more than 70.

The proportion test is used to determine a classically complete class. The hypotheses used are $H_0 : p \geq 70\%$ (classical mastery learning is achieved) and $H_a : p < 70\%$ (classical learning mastery is not achieved). Based on the calculation of classical completeness of the experimental class 1, it was obtained that $z_{hitung} = 0.117$ $z_{tabel} = -1.640$ means $z_{count} \geq z_{table}$, the learning outcomes of experimental class 1 students have achieved learning mastery. For the experimental class 2, it was found that $z_{count} = 0.864$ $z_{table} = -1.640$, which means that $z_{count} \geq z_{table}$, then the learning outcomes of the experimental class 2 students have achieved mastery learning.

From the results of the t-test and the classical learning mastery test of students, it can be concluded that the learning of students who use the Problem Based Learning (PBL) learning model with the help of kahoot is better than students who receive learning using the conventional model. In accordance with the advantages of the Problem Based Learning (PBL) learning model which applied to the experimental class I that the Problem Based Learning (PBL) learning model can make students active, in the learning process more understanding of the material being studied.

This research is in line with research conducted by Meli (2018) which states that the learning model with Problem Based Learning (PBL) is more stimulating and challenging for students, Problem Based Learning (PBL) learning affects learning outcomes than using conventional learning models. This is in line with research conducted by Aprianta (2017) that student learning outcomes using the Problem Based Learning (PBL) learning model assisted by 3D cabri are better than conventional learning. This is also in line with research conducted by Fatade (2016) which explains that the PBL approach makes students more creative, acts intentionally, thinks rationally, and relates effectively to their peers in class.

The learning outcomes of students who use the Project Based learning (PjBL) learning model with the help of kahoot are better than students who receive conventional learning. In the Project Based learning (PjBL) learning model in the experimental class II students play an active role and exchange ideas with each other, learn to express opinions, seek information from other pairs of groups. This research is in line with research conducted by Chandra (2015) which states that PjBL learning is effective in improving learning outcomes for STKIP PGRI Pontianak Students, PTIK Study Program. Project based learning (PjBL) can stimulate motivation, process, and improve student achievement. This is also in line with research conducted by Johnson (2008) that PjBL is able to connect academic content with real-world contexts. This is also in line with Lucky's research (2015) which states that the project based learning (PjBL) learning method with mind meeting media is effective on student learning achievement.

The learning outcomes of students who used the Problem Based Learning (PBL) learning model with the help of kahoot were better than students who received the learning model of Project Based learning (PjBL) with the help of kahoot. There is no difference in student learning outcomes using Kahoot-assisted Project based Learning (PjBL) learning models with student learning outcomes using Kahoot-assisted project-based learning (PjBL) learning models. This is because the Project based Learning (PjBL) learning model with the help of kahoot and the Project based Learning (PjBL) model with the help of kahoot both have advantages during the learning process so that both models produce maximum results.

Student learning outcomes using the Problem Based Learning (PBL) learning model with the help of kahoot and the Project Based learning (PjBL) learning model with the help of kahoot to achieve classical and individual mastery. The one-sided proportion test aims to determine student learning outcomes using the Problem Based Learning (PBL) learning model assisted by Kahoot and the Project Based Learning (PjBL) learning model to assist Kahoot to achieve individual and classical mastery. Based on the results of the statistical test of the experimental class I and the experimental class II of individual completeness, it was found that student learning outcomes reached the KKM, for classical completeness based on

the proportion test classically completed. As with the research conducted by Prasetyowati (2013) because the results of the data acquisition of the average value of the experimental class is higher than the average of the control class, it is concluded that the experimental class experienced completeness compared to the control class. Due to the limited research time, the researcher feels less than optimal in conducting research. It is advisable for further researchers to extend the research so that the research results are more relevant.

Conclusion

The results showed that: (1) The learning outcomes of students who received the problem-based learning (PBL) assisted kahoot learning model were better than the learning outcomes of students who received conventional learning models. (2) The learning outcomes of students who received project-based learning (PjBL) assisted kahoot learning models were better than the learning outcomes of students who received conventional learning models. (3) The learning outcomes of students who received the Problem Based learning (PBL) learning model assisted by Kahoot were as good as the learning outcomes of students who received the Project Based learning (PjBL) learning model. (4) Student learning outcomes using problem-based learning (PBL) and project-based learning (PjBL) learning models help to achieve mastery both classically and individually.

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