Project-Based Learning with Google Spreadsheets : An Effective Approach to Improving Student Learning Interest and Collaboration

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Abstract: This study aims to measure the effectiveness of the use of the Project Based Learning (PjBL) learning model assisted by Google Spreadsheet in increasing students' interest in learning and collaboration skills in Informatics subjects at SMKN 1 Arosbaya. The approach in this study is a quantitative with an experimental research type through a Quasi Experimental Design, namely Non-equivalent Control Group Design. In this design, both the experimental group and the control group are compared, although the group is selected and placed without going through random. The sample in this study was class X PHT B as the control class and class X PHT C as the experimental class with 35 students in each class. Hypothesis testing 1 and 2 using the independent sample t-Test, in hypothesis 1 it produces sig. 0.000 where H0 is rejected which means there is a significant influence between PjBL assisted by Google Spreadsheet on learning interest. Hypothesis testing 2 produces sig. 0.000 where H0 is rejected, which means that there is a significant influence between PjBL assisted by Google Spreadsheet on collaboration skills. In the hypothesis test 3 using the MANOVA test which shows a sig. level of 0.000 where the data shows that the significance level <0.05 then H0 is rejected, which means that there is a significant influence between PjBL assisted by Google Spreadsheet on learning interest and collaboration skills.

Introduction

Through the rapid development of technology has brought significant changes in various aspects of life, including the world of education. Integration of technology in the learning process is a necessity to meet the demands of the 21st century which requires individuals who are creative, critical, and able to collaborate. According to J. Stivers & Brandon (2010), PjBL is described as an innovative learning approach, where students are given the opportunity to apply their knowledge and skills in real-world contexts through collaborative projects. In learning, a technology is needed that can support teaching and learning activities to facilitate the work of teachers and students, especially in Informatics subjects for class X students at SMKN 1 Arosbaya. In the Informatics subject there are learning achievements of Information and Communication Technology (ICT) which contain office application materials, one of which is number processing.

The teaching and learning process on ICT learning outcomes with office application material for processing numbers using Microsoft Excel, where its use is not very efficient in terms of accessibility. When practicing using Ms. Excel, there must be Microsoft Excel software on a computer. In addition, when collaborating or working in groups, the use of Ms. Excel is still less efficient because Ms. Excel is an application that is not yet internet-based, so if you are working on assignments collaboratively, it must be done on the same computer.

Based on the results of observations and discussions conducted with Informatics teachers and class X students of SMKN 1 Arosbaya, it was found that students still have low interest during classroom learning and collaboration skills are still lacking in Information and Communication Technology (ICT) material. Learning on this material using spreadsheets, namely Ms. Excel, still makes learning less accessible. From the results of the researcher's observations, students tend not to complete their assignments on time, namely when working on practical assignments both individually and in groups using Ms. Excel due to limited access when using the Ms. Excel application. When working on assignments collaboratively, students have difficulty working on assignments because Excel has limitations in terms of real-time collaboration.

Unlike Google Spreadsheet, which is more efficient to use because there is no need for specific software on the computer. Students will also find it easier to collaborate because Google Spreadsheet is connected to the student's Google account so that assignments can be collected by simply sending their assignment link to the teacher.

In the past, learning was still centered on the teacher or in other words Teacher Centered. However, along with the rapid development of the era, especially in the field of information and communication technology (ICT), the face of education has also changed drastically. With the new curriculum, the teaching and learning process in the classroom has changed to student-centered learning or in other words Student Centered. The Teaching and Learning Process (PBM) is an important factor in student success. The more interesting the teaching and learning process that occurs both in and outside the classroom, the more it will affect students' interest in learning. The use of the right learning model and interesting media will also affect the quality of learning in the classroom. Cloud-based digital media will be easier to use for collaboration and in completing student assignments.

In Informatics subjects with ICT learning outcomes, a project-based learning model is needed. The PjBL learning model will be suitable for ICT learning outcomes with office application materials. The Project Based Learning learning model is a learning model in which students learn actively and deeply through projects that they design and work on themselves. In this model, students work together in groups to complete projects that are relevant to certain subject matter or topics. PjBL emphasizes active learning, problem solving, and practical application of the knowledge and skills learned (Mayasari et al., 2016).

Based on the results of the observation, a Project Based Learning (PjBL) learning model will be developed using Google Spreadsheet. The selection of the Project Based Learning (PjBL) learning model is because the model is appropriate for students to find a solution to a problem, in addition, so that students can learn the concept of how to solve problems and develop critical thinking skills where this will be able to increase student interest and learning outcomes. The use of Google Spreadsheet media will make it easier for students to apply the Project Based Learning (PjBL) learning model where Google Spreadsheet itself is a cloud-based Spreadsheet application that allows students to collaborate with their groups in real-time and are able to process assignments given by teachers easily because they can be accessed from various devices.

This study attempts to prove the effectiveness of using Project Based Learning (PjBL) supported by Google Spreadsheet in increasing students' interest in learning, students' collaboration skills, and a combination of both (interest in learning and collaboration skills). This research is significant because it has the potential to revolutionize the way informatics is taught, especially in today's digital age. The findings of this study can significantly change

students' interest in a subject that is often considered complex, making it more interactive and relevant through the use of Google Sheets in project-based learning.

Research Method

This study employs a quantitative approach with a quasi-experimental research design, specifically the Non-equivalent Control Group Design. This design is similar to the Pretest-Posttest Control Group Design, but differs in that the experimental and control groups are not randomly selected (Sugiyono, 2017). In this design, both the experimental group and the control group are compared, although the group is selected and placed without going through random. The two existing groups are given a pretest, then given treatment, and finally given a posttest. The difference between the pretest and posttest results shows the results of the treatment that has been given. The pretest-posttest instruments given contain the same weight

$$
\begin{array}{llll}
\text{KE} & O_1 \longrightarrow & x \longrightarrow & O_2 \\
\text{KK} & O_3 \longrightarrow\!\!\!\!\!\longrightarrow\!\!\!\!\!\longrightarrow & & O_4
\end{array}
$$
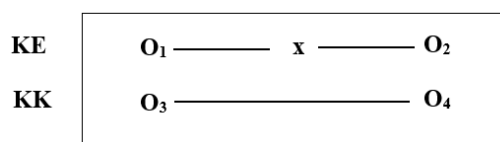
(Sugiyono, 2018)

Description:
KE : Experimental Class
KK : Control Class
X : Treatment of PjBL implementation assisted by Google Spreadsheet
O1 : Pretest experimental class
O2 : Posttest experimental class
O3 : Pretest control class
O4 : Posttest control class

The sampling technique used purposive sampling technique, where the sampling will be taken based on certain considerations. Referring to this, the researcher chose two classes to be the research sample with certain considerations, namely the characteristics of the class that are almost the same and the average report card scores are almost the same. The first class as the control class is 35 students of class X PH B and the second class as the experimental class is 35 students of class X PH C. The instrument used in this study was a questionnaire on learning interests and collaboration skills consisting of 20 statements. The questionnaire used was a rating-scale questionnaire consisting of five answer choices, namely Strongly Agree (SS), Agree (S), Less Agree (KS), Disagree (TS), Strongly Disagree (STS).

Before conducting research, the questionnaire must be tested for validity. The rational validity test was conducted by a group of experts concerning construct, language and content. Some input from expert validators was the number of positive and negative question items to be randomized, shorter and clearer sentences considering that the respondents were vocational high school students, if during the empirical validity test there were invalid question items, they could be analyzed and revised again. Based on corrections and input from experts, the instrument was revised to then be tested for empirical validity. The empirical validity test was conducted to determine the validity and reliability of each item of statements that had previously been approved (Eliya, 2009). The results of the validity test of the learning interest and collaboration skills questionnaire filled out by 30 respondents showed that the data obtained was valid because the r count was greater than the r table value,

which was 0.361. Then the results of the reliability test of learning interest and collaboration skills were also declared reliable because Cronbach's Alpha was higher than the basic value, which was 0.60.

The data analysis techniques used in this study are as follows:

1). Prerequisite Test

a). Normality Test

The normality test is conducted to determine whether the research data is normally distributed or not.

b). Homogeneity Test

The homogeneity test is conducted to determine whether the two subjects come from a population that has homogeneous variance or not.

2). Hypothesis Test

The data analysis technique used to test the first and second research hypotheses is the Independent Sample T-Test analysis technique. The analysis technique used to test the third hypothesis is the MANOVA data analysis technique. In the hypothesis test, if the sig. value is ≤ 0.05, the research hypothesis is accepted and if the sig. value is > 0.05, the research hypothesis is rejected.

Results and Discussion

From the results of data collection, data on learning interest and collaboration skills obtained during 3 meetings using the questionnaire method on the results of the pre-test and post-test data. The following is the data collection that has been carried out in the experimental class, namely class X PH C and the control class, namely class X PH B at SMKN 1 Arosbaya. At the prerequisite test stage there is a normality test and a homogeneity test, where before the data is processed, the data must be ensured to be normal and homogeneous. The normality test is carried out using the Kolmogorov-Smirnov Test by measuring if the resulting value is less than 0.05 then the distribution is considered abnormal, conversely if the results obtained are more than 0.05 then the distribution is stated to be normal so that a hypothesis test can be carried out. The results of the normality test are as follows:

Table 1. Results of the Normality Test of Learning Interest

Tests of Normality						
Kelas	Kolmogorov-Smirnov\u00aa			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pretest Eksperimen	.131	35	.137	.960	35	.227
Posttest Eksperimen	.131	35	.138	.958	35	.194
Pretest Kontrol	.123	35	.200*	.939	35	.053
Posttest Kontrol	.108	35	.200*	.940	35	.055

Table 2. Results of the Collaboration Skills Normality Test

Tests of Normality						
Kelas	Kolmogorov-Smirnov\u00aa			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pretest Eksperimen	.123	35	.199	.961	35	.250
Posttest Eksperimen	.128	35	.157	.951	35	.121
Pretest Kontrol	.127	35	.163	.951	35	.123
Posttest Kontrol	.130	35	.145	.962	35	.262

Based on the results of the normality test of learning interest and collaboration skills data, the sig. value is greater than 0.05, so the research data is normally distributed. Furthermore, a homogeneity test is carried out. The results of the homogeneity test are as follows:

Table 3. Results of the Homogeneity Test of Learning Interest

		Levene Statistic	df1	df2	Sig.
		Test of Homogeneity of Variance			
Hasil	Based on Mean	1.193	3	136	.315
	Based on Median	.988	3	136	.401
	Based on Median and with adjusted df	.988	3	125.743	.401
	Based on trimmed mean	1.169	3	136	.324

Table 4. Results of the Homogeneity Test of Collaboration Skills

		Levene Statistic	df1	df2	Sig.
		Test of Homogeneity of Variance			
Hasil	Based on Mean	1.988	1	68	.163
	Based on Median	1.843	1	68	.179
	Based on Median and with adjusted df	1.843	1	64.091	.179
	Based on trimmed mean	1.977	1	68	.164

The results of the homogeneity test of learning interest and collaboration skills produced a significance value (Sig.) greater than 0.05, which means that all data are declared homogeneous. Hypothesis tests 1 and 2 used the independent Sample t-Test. Hypothesis 1 formulated that "There is an effectiveness of using Project Based Learning (PjBL) assisted by Google Spreadsheet in increasing students' learning interest". The results of the analysis obtained based on the results of the independent Sample t-Test variable test produced sig. 0.000 where Because the value is far below 0.05, H0 is rejected, which means that there is a significant influence between PjBL assisted by Google Spreadsheet on learning interest at a 95% confidence level.

In hypothesis 2 it is formulated that "There is an effectiveness of using Project Based Learning (PjBL) assisted by Google Spreadsheet in improving students' collaboration skills". The results of the analysis obtained based on the results of the independent variable test Sample t-Test produced sig. 0.000 where Because the value is far below 0.05 then H0 is rejected which means there is a significant influence between PjBL assisted by Google Spreadsheet on collaboration skills at a confidence level of 95%.

Hypothesis 3 is formulated that "There is an effectiveness of using Project Based Learning (PjBL) assisted by Google Spreadsheet in increasing students' learning interest and collaboration skills". This hypothesis testing uses the MANOVA test and shows a sig. level of 0.000 where the data shows that the significance level <0.05 then H0 is rejected. So it can be concluded that there is an effectiveness of using Project Based Learning (PjBL) assisted by Google Spreadsheet in increasing students' learning interest and collaboration skills.

The results of the study showed that there was a difference in students' learning interests in the experimental class and the control class where in the experimental class, namely class X Hospitality C which was given treatment using PjBL learning assisted by Google Spreadsheet showed better results than the control class, namely class X Hospitality B which was not given treatment. The results of the N-Gain Score test calculation showed that the average N-Gain Score for the experimental class, namely class X Hospitality C which

was given treatment using PjBL learning assisted by Google Spreadsheet was 45%, included in the fairly effective category. Meanwhile, the average N-Gain Score in the control class, namely class X Hospitality B which was not given treatment, was 37%, included in the ineffective category.

The findings of this study consistently reinforce that the implementation of PjBL learning assisted by Google Spreadsheet is effective in fostering students' interest in learning. Students' enthusiasm and positive responses during learning activities, as well as good attention since the beginning of implementation, clearly indicate a deep interest in this approach. This is in line with Poerwanto's view (2010) who defines interest as an emotional state characterized by a deep and continuous interest in an object or activity, where in this context, the "object or activity" is the PjBL learning model integrated with Google Spreadsheet.

The results of the research on collaboration skills in the experimental class and the control class where in the experimental class, namely class X Hospitality C which was given treatment using PjBL learning assisted by Google Spreadsheet showed better results than the control class, namely class X Hospitality B which was not given treatment. The results of the N-Gain Score test calculation showed that the average N-Gain Score for the experimental class was 62%, included in the fairly effective category. Meanwhile, the average N-Gain Score in the control class was 38%, included in the ineffective category.

The findings of this study can be linked to previous research conducted by Heri, Dwi (2022) regarding the influence of RME on collaboration skills. Although the focus of the material and learning approaches are different (Google Spreadsheet-assisted PjBL compared to RME), there is an interesting common thread related to improving students' collaboration skills.

The study showed a positive effect of RME on students' collaboration skills. RME, with its emphasis on using real-world contexts and solving relevant problems, has philosophical similarities to PjBL which also encourages students to engage in authentic tasks. Engaging in solving meaningful problems and collaborating with peers in the context of RME has been shown to improve students' collaboration skills. This parallelism indicates that a learning approach that is oriented towards contextual problem solving and encourages collaborative interactions, both through projects (in PjBL) and through realistic problems (in RME), has significant potential in improving students' collaboration skills. The use of Google Spreadsheet in this study can be analogous to the tools used in the implementation of RME, where both function as facilitators that support students in the learning and collaboration process.

There is a close reciprocal relationship between increased learning interest and collaboration skills. High learning interest often encourages students to participate more actively in group activities and contribute significantly to projects. When students are interested in a topic, they tend to be more motivated to share ideas, listen to others and work together to achieve common goals.

Conversely, good collaboration skills can increase learning motivation. When students feel supported by their teammates and see that their contributions are valued, they tend to feel more confident and motivated to learn more. A positive collaborative environment can also reduce learning anxiety and create a more enjoyable atmosphere, which in turn increases overall learning motivation. In the context of Google Sheets-assisted PjBL, good collaboration allows students to focus on the core of the project, rather than being bogged down by coordination issues, freeing them to dive deeper and enjoy the learning

process. Overall, PjBL utilizing Google Sheets proved to be a powerful approach to not only enhance learning interest and collaboration skills separately, but also strengthen the positive relationship between the two, creating a more holistic and effective learning experience.

Conclusion

Based on the research that has been conducted, it can be concluded that the implementation of Project Based Learning (PjBL) integrated with Google Spreadsheet has a significant effect on increasing students' learning interest and collaboration skills. This is evident from the higher increase in both aspects in the experimental class that implemented PjBL assisted by Google Spreadsheet compared to the control class that did not use this method. Furthermore, the results of the Multivariate Analysis of Variance (MANOVA) test with a significance value of 0.000 (p <0.05) indicate that students' learning interest and collaboration skills are closely related and significantly influenced by the implementation of PjBL assisted by Google Spreadsheet. Thus, it can be stated that PjBL assisted by Google Spreadsheet is an effective learning approach in improving both students' learning interest and collaboration skills.

Recommendation

Considering the significant positive impact of the implementation of Project Based Learning (PjBL) assisted by Google Spreadsheet revealed in this study, several important suggestions need to be considered. First, Informatics subject teachers, especially at SMKN Arosbaya, are strongly advised to adopt and integrate the PjBL learning approach supported by Google Spreadsheet as one of the relevant alternatives in the teaching and learning process. This method has proven effective in increasing students' learning interest and collaboration skills, which are important competencies in this digital era. Second, as a further development step, further researchers are encouraged to compile Informatics teaching modules that specifically discuss the material of Spreadsheet office applications, with a focus on Google Spreadsheet, and are designed based on the PjBL learning model. It is hoped that the existence of this structured teaching module will provide convenience and practical guidance for teachers in implementing PjBL assisted by Google Spreadsheet, as well as facilitating students in understanding the material more deeply and applicatively.

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