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The Effectiveness of the Microsoft Sway Assisted Problem-Based Learning Model on Science Learning Outcomes

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Abstract: The use of learning models and media that are not in accordance with the 2013 Curriculum has an impact on the low learning outcomes of students. This study examines the effectiveness of the Microsoft Sway-assisted Problem-Based Learning Model on learning outcomes in fifth-grade science at elementary school of Gugus Kartini Mejobo Kudus compared to the Direct Instruction Model. This research is included in the type of experimental research with a quasi-experimental research design in the form of a Nonequivalent Control Group Design. The population in this study were 95 fifth-grade students at elementary school of Gugus Kartini, Mejobo District, Kudus Regency using purposive sampling techniques. In this study, Elementary School 1 Payaman served as the experimental class and Elementary School 1 Gulang as the control class. Data collection techniques using test techniques (pretest and posttest); and non-test techniques with observation, interviews, documentation, and questionnaires. Data analysis techniques include initial data analysis by normality and homogeneity tests and final data analysis by t-test and N-Gain tests. The t-test results obtained a sig value of 0.000, less than 0.05. So that Ho is rejected and Ha is accepted. This is supported by the N-Gain test results for the experimental class of 0.45 and control classes of 0.35. So, it can be concluded that the Problem-Based Learning Model assisted by Microsoft Sway is more effective than the Direct Instruction Model for science learning outcomes in fifth grade elementary school.

Keywords: Effectiveness; Learning Outcomes; Microsoft Sway; Problem-Based Learning Model; Science.

Introduction

Education is very important for every citizen. The Law on the National Education System Number 20 of 2003 explained that education is a planned effort to realize the learning process and learning atmosphere so that students can actively develop their potential in accordance with the goals and functions of national education. To realize the goals of national education, a curriculum has been developed that can be used as a reference for carrying out the educational process. The curriculum that is still running in Indonesia today is the 2013 curriculum. The 2013 curriculum is a curriculum that is made with careful planning and is still relevant to face the challenges of the times and in accordance with the needs of the development of students in the Industrial Revolution 4.0 era through the development of attitudes, skills, and knowledge (Fernandes, 2019; Wiyogo, 2020). The 2013 curriculum is a curriculum that uses an integrated scientific approach according to the Regulation of the Minister of Education and Culture Number 20 of 2016 concerning Competency Standards for Graduates of Primary and Secondary Education, namely that every graduate of a primary and secondary education unit has competence in three dimensions, namely attitude, knowledge, and skills.

Based on the Regulation of the Minister of Education and Culture Number 21 of 2016 concerning Content Standards states that the curriculum structure for elementary school/MI, elementary school or packages consists of eight subject contents, one of which is Natural Sciences (known with IPA). IPA is the content of lessons related to the daily life of students. So that science learning can begin with an introduction to

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problems that are appropriate to the environment around students (Afifah & Minsih, 2021). The purpose of learning science is to develop process skills to investigate the natural surroundings, solve problems and make decisions (Atminingsih et al., 2019; Gulo, 2022).

To achieve these science learning objectives, the learning process can be carried out in accordance with the Minister of Education and Culture Regulation Number 22 of 2016 concerning Process Standards for Elementary and Secondary Education, namely the learning process in educational units is carried out interactively, inspiring, fun, challenging, motivating students to participate active and provide sufficient space for initiative, creativity, and independence in accordance with the talents, interests, and physical and psychological development of students. However, in reality, learning science in elementary schools is not in accordance with Permendikbud No. 22 of 2016, and in its implementation, various problems are still found.

One of the problems in science learning is the low science learning outcomes caused by the teacher's less optimal role during the learning process. The low learning outcomes can be caused by several things, namely the learning model used in the class is less innovative, so it tends to make students bored in learning; the use of media does not attract the attention of students; students are less involved in learning (Astiti et al., 2021; Murdani et al., 2022). This problem indicates that the science learning process carried out by teachers is still carried out conventionally and has not fully implemented active and creative learning involving students (Khoiriyah et al., 2022; Wahyuningtyas & Sulasmono, 2020).

Science learning problems also occur in fifth grade elementary school of Gugus Kartini, Mejobo District, Kudus Regency. Based on the results of observations and interviews with fifth-grade teachers, the researchers found various problems, including the learning model used by the teacher while learning was not in accordance with the 2013 Curriculum learning model and still tended to be dominated by the teacher. The teacher has tried using the direct learning model (Direct Instruction) but there are still some obstacles during learning because this learning model is still teacher-centered. The learning resources used in learning are only using textbooks and worksheets. The learning media used by the teacher only uses pictures and is not technology based. Therefore, students will easily get bored and not focus during learning. In addition, the learning process that takes place is not based on TPACK (Technological Pedagogical Content Knowledge). Teachers have not integrated technology during the learning process even though the existing facilities and infrastructure are quite adequate. Each school already has an LCD, speakers, and internet networks such as Wi-Fi, but these facilities have not been used by teachers to the fullest.

Based on the results of student questionnaires and interviews with fifth-grade teachers at elementary school of Gugus Kartini, Mejobo District, Kudus Regency, it was found that the percentage of students who were active in class was around 40%, the rest were students who were not active in class. Not all of the students' natural science learning outcomes met the KKM. For the KKM that applies to all pupils, it is 75. These findings are supported by data on science learning outcomes obtained from the documentation of students' grades. At elementary school 1 Payaman with 36 students, 20 (56%) scored below the KKM. At elementary school 3 Payaman with a total of 7 students, 3 students (43%) scored below the KKM. In elementary school 1 Gulang with a total of 33 students, there were 21 students (64%) who scored below the KKM. In elementary school 2 Gulang with a total of 19 students, there were 13 students (68%) who scored below the KKM. According to the fifth-grade teacher, this was because the students did not really study well, and the students' lack of understanding of the very complex science material.

Based on the problems in science learning in fifth grade elementary school of Gugus Kartini, science learning should be carried out in accordance with the 2013 Curriculum and Learning Process Standards in Permendikbud Number 22 of 2016. The learning model in the 2013 Curriculum that is appropriate to these problems is the Problem-Based Learning Model, namely the learning model that can make students actively involved in the learning process and solve problems (Ariyani & Kristin, 2021; Khoiriyah et al., 2022; Lisnawati et al., 2022). The Problem-Based Learning model is a learning model that begins with giving a problem to students and then analyzing it and finding a solution to solve that problem (Yansah et al., 2023). The problems presented can come from problems that exist in students' daily lives (Safithri et al., 2021).

The use of the Problem-Based Learning Model which consists of five phases can provide a student-centered learning experience so that students compile their findings on a concept (Badria et al., 2019). In addition, the Problem-Based Learning Model can increase the activity and activity of students in the learning (A. Mayasari et al., 2022; Yunitasari & Hardini, 2021). The advantages of the Problem-Based Learning Model include: (1) Students are involved in learning so that they can increase their activities and knowledge; (2) Students are trained to work together and discuss with other students; and (3) Students can seek solutions to problems from various sources (T. Mayasari et al., 2016; Sulastry et al., 2023; Yuwono & Syaifuddin, 2017). The use of the Problem-Based Learning Model can help

students in the learning process so that they can increase learning activities, critical thinking skills, and improve their learning outcomes (Agustini et al., 2021; Suhada & Ahmad, 2023).

This is consistent with the results of previous research which showed that the use of the Problem-Based Learning Model was able to increase student learning activities so that student learning outcomes could increase significantly (Sumardi, 2020). Other research also shows that the Problem-Based Learning Model can significantly improve the integrated thematic learning outcomes of elementary school students (Ulva & Ahmad, 2020).

Looking at the facts on the ground, teachers at Gugus Kartini Elementary school have not implemented technology-based learning. Therefore TPACK (Technological Pedagogical Content Knowledge) can act as a learning framework that can help teachers think about how to increase knowledge by integrating technology into the learning process (Wardani & Jatmiko, 2021). To realize technology-based learning, researchers will use Microsoft Sway as a learning medium

Microsoft Sway is a web-based application rather than software that must be installed on a PC or laptop (Agustin et al., 2021; Diyah et al., 2022). Microsoft Sway is a product of Microsoft Office that has almost the same functionality as Microsoft Office PowerPoint (Astuti et al., 2022; Merliana et al., 2021). This Microsoft Sway includes presentation tools that are created and displayed online on the sway.com page. On the sway.com page, a presentation design template is available that can be used, then the presentation results that have been made can be shared using a link (Ardian et al., 2020; Retnasari & Sukma, 2021).

The advantages of Microsoft Sway include (1) it can be used as audio-visual and video media without having to download it, (2) the appearance can be designed according to the teacher's wishes to make it more attractive, (3) can add attendance or questions with the Microsoft form in the form of a link, (4)) the teacher can monitor who is participating, (6) can help present the material to be demonstrated to students easily (Afrianti, 2022; Ardian et al., 2020).

Based on this description, this study aims to test the effectiveness of the Problem-Based Learning Model assisted by Microsoft Sway on science learning outcomes in fifth grade at elementary school of Gugus Kartini, Mejobo District, Kudus Regency. This study was also used to determine the learning science outcomes of a problem-based learning model assisted by Microsoft Sway for fifth grade elementary school of Gugus Kartini, Mejobo District, Kudus Regency.

Method

This type of research is experimental research with a quasi-experimental research design in the form of a Nonequivalent Control Group Design. At the beginning of learning, the experimental class and the control class were given a pretest first to measure students' initial abilities. Furthermore, the two classes were given different treatments. The treatment given in the experimental class was using the Microsoft Sway-assisted Problem-Based Learning Model while the control class used the Direct Instruction Model. At the end of learning the two classes were given a posttest to determine the effect of the different treatments that had been given in each class. The following is a form of quasi-experimental research design presented in the following table.

Table 1: Research Design

Group	Pre-test	Treatment	Post-test
Experiment	O_1	X_1	O_2
Control	O_3	X_2	O_4

(Sugiyono, 2022)

Information:
O_1: experimental class pretest
O_2: posttest experimental class
O_3: control class pretest
O_4: posttest control class
X_1: treatment in the experimental class using the Microsoft Sway Assisted Problem-Based Learning Model
X_2: treatment in the control class using the Direct Instruction Model.

The treatment in this study was carried out during the learning of science content on the Water Cycle with Theme 8 (Our Friends' Environment) Sub-theme 1 (Humans and the Environment) Learning 1 with the following Basic Competences:
3.8. Analyze the water cycle and its impact on events on earth and the survival of living things.
4.8. Make works on water cycle schemes based on information from various sources.

The population in this study were all fifth-grade students at elementary school of Gugus Kartini as many as 95 students who were used by researchers for preliminary studies. This research uses a purposive sampling technique. So that the samples in this study were fifth grade elementary school 1 Payaman as many as 27 students as the experimental class and elementary school 1 Gulang as many as 30 students as the control class. There are two variables used in this study, namely the independent variable (X) and the dependent variable (Y). The independent variable (X) is the Microsoft Sway-assisted Problem-Based Learning Model while the

dependent variable (Y) is the result of learning science in fifth grade elementary school Gugus Kartini.

The hypothesis in this study is that the Microsoft Sway-assisted Problem-Based Learning Model is ineffective compared to the Direct Instruction model for learning outcomes of science mupel grade V elementary school of Gugus Kartini Mejobo Kudus (H_0); The Problem-Based Learning model assisted by Microsoft Sway is more effective than the Direct Instruction model for the learning outcomes of science mupel fifth grade elementary school of Gugus Kartini Mejobo Kudus (H_a).

Data collection techniques in this study are using test and non-test techniques. Test techniques are by giving pretest and posttest while non-test techniques are carried out by observation, interviews, documentation, and questionnaires. This study uses preliminary data analysis and final data analysis. Preliminary data analysis with prerequisite tests which include the normality test and homogeneity test while the final data analysis uses the t test and N-Gain test.

Result and Discussion

From the results of research that has been conducted at elementary school 1 Payaman as an experimental class and elementary school 1 Gulang as a control class in Cluster Kartini, Mejobo District, Kudus Regency, there are several things that will be studied in the results and discussion, namely: (1) students' natural science learning outcomes; (2) pretest data normality test control class and experimental class; (3) pretest data homogeneity test control and experimental classes; (4) the posttest data normality test for the control class and the experimental class; (5) posttest data homogeneity test for control and experimental classes; (6) test the hypothesis of the control class and the experimental class; (7) N-Gain test for control class and experimental class; (8) Student activities.

In this study, students' science learning outcomes were in the form of cognitive learning outcomes derived from the pretest and posttest scores of the control class and the experimental class. The following are the pretest and posttest learning outcomes for the control class and the experimental class:

Table 2. Student Learning Outcomes

No	Information	Pre-test		Post-test	
		Control	Experiment	Control	Experiment
1	Number of Students	30	27	30	27
2	Average	55.93	62.48	71.03	80.93
3	The Highest Score	80	80	90	93
4	Lowest Value	33	33	57	67
5	Completed Number of Students	5	8	13	21
6	Mastery learning	16.66%	29.62%	43.33%	77.7%

Based on Table 2, it can be concluded that the pretest and posttest learning outcomes of students using the Microsoft Sway Assisted Problem-Based Learning Model were higher compared to the control class using the Direct Instruction Model.

The normality test in this study used the help of the SPSS 25 program. Before being given treatment, the control class and the experimental class were given a pretest first. To find out the initial and final data on science learning outcomes on the Water Cycle material for fifth-grade students at elementary school of Gugus Kartini, Mejobo District, Kudus Regency, whether or not they have a normal distribution, a normality test will be carried out. Whereas after being given treatment, the control class and the experimental class were given a posttest. Following are the results of the pretest and posttest data normality tests presented in the Table 3.

Table 3. Output of Pretest and Posttest Data Normality Test Results

Class		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Learning outcomes	Experiment Pretest	0.140	27	0.190	0.929	27	0.064
	Pretest Control	0.130	30	0.200*	0.933	30	0.059
	Posttest Experiment	0.151	27	0.114	0.958	27	0.332
	Posttest Control	0.143	30	0.120	0.965	30	0.424

Based on Table 3, it was found that the pretest significance value for the experimental class was 0.190 and the post-test was 0.114. Meanwhile, the pretest significance value for the control class was 0.200 and the posttest was 0.120. So, it can be concluded that the significance value of the experimental class and the control class is greater than 0.05 so that H_0 is accepted

and H_a is rejected. So, the initial pretest data and posttest final data are normally distributed.

The homogeneity test used the students' pretest and posttest scores to determine whether the two classes came from the same population or not. Following are the results of the pretest and post-test data homogeneity tests presented in Table 4.

Table 4: Output of Pretest and Posttest Data Homogeneity Test Results.

Learning Outcomes		Levene Statistic	df1	df2	Sig.
Based on Mean	Pretest	0.543	1	55	0.464
	Posttest	1.535	11	43	0.154

Based on Table 4, the pretest significance value for the two classes was 0.464 and the posttest significance value for the two classes was 0.154. So, it can be concluded that the sig value of the pretest and posttest data homogeneity test results is greater than 0.05 so that H_0 is accepted, which means the data is homogeneous or there is no difference in variance between the two classes. Based on the results of the prerequisite test, it can be concluded that the data in this study are normally distributed and homogeneous so that a hypothesis test can be carried out with the Independent Sample T Test.

The hypothesis testing in this study used students' posttest scores to determine the effectiveness of the Microsoft Sway Assisted Problem-Based Learning Model in the experimental class and the Direct Instruction model in the control class. The hypothesis test used in this study is the t-test and the N-Gain test. The following are the results of the t-test with the help of SPSS 25 which are presented in Table 5.

Table 5: Output of T-Test Results

		Leven's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Result	Equal variances assumed	6.996	0.011	4.046	55	0.000	9.893	2.445	4.992	14.793
	Equal variances not assumed			4.134	50.370	0.000	9.893	2.393	5.087	14.698

Based on table 5, the t-test for Equality of Means has a significance value of 0.000. The sig value is less than 0.05. So that H_0 is rejected and H_a is accepted. So, it can be concluded that the Problem-Based Learning Model assisted by Microsoft Sway is effective compared to the Direct Instruction model for science learning outcomes in fifth grade elementary school of Gugus Kartini Mejobo Kudus.

The N-Gain test was carried out to calculate the increase in student learning outcomes before and after being given treatment in the experimental class and also the control class. The N-Gain test in this study used the SPSS 25 program. The increase in pretest and posttest scores of fifth grade students at elementary school of Gugus Kartini, Mejobo District, Kudus Regency can be observed in Table 6.

Table 6: Average Increase Test Results (N-Gain)

Class	Average		N-Gain	Category
	Pretest	Posttest		
Experiment	62.48	80.93	0.45	Currently
Control	55.93	71.03	0.35	Currently

Based on table 6, it can be seen that the increase in the pretest value to the posttest value in the experimental class of 0.45 is included in the medium category. In the control class there was an increase of 0.35 including the moderate category. The following (Figure 2) is a diagram of increasing pretest scores to posttest scores.

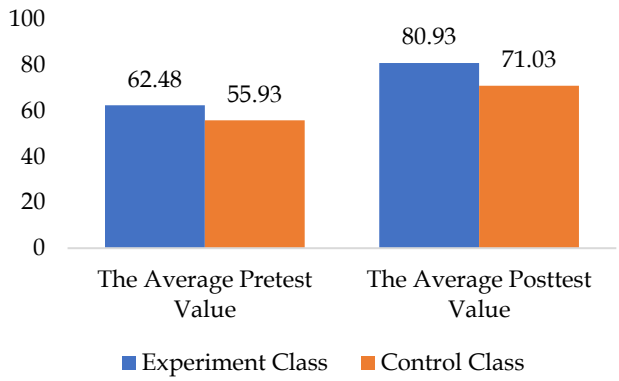

Figure 2. Pretest and Posttest Score Increase Diagram

Based on Figure 2, both classes have almost the same initial abilities, but after being given treatment in the experimental class using the Problem-Based Learning Model assisted by Microsoft Sway there is a

higher increase compared to the control class which applies the Direct Instruction Model. This is in line with research conducted by (Gulo, 2022; Mariya, 2019) which states that the application of the Problem-Based Learning Model is effective in improving science learning outcomes for fifth graders of elementary school. In addition, the results of research conducted by (Dewi & Wulandari, 2019) also state that the Problem-Based Learning Model is more effective than the direct learning model.

In this study, to obtain student activity data, the researcher used student activity observation sheets. Observations made in the experimental class used the Microsoft Sway-assisted Problem-Based Learning Model through recapitulation of student activity observation sheets. Observation of student activities can be observed with five indicators adapted to the syntax of the Problem-Based Learning Model including (1) student orientation to problems; (2) Organizing students for investigations; (3) Guiding individual/group investigations; (4) Develop and present works; (5) Analyze and evaluate the investigation process. The following is a diagram of the activities of experimental class students during three meetings.

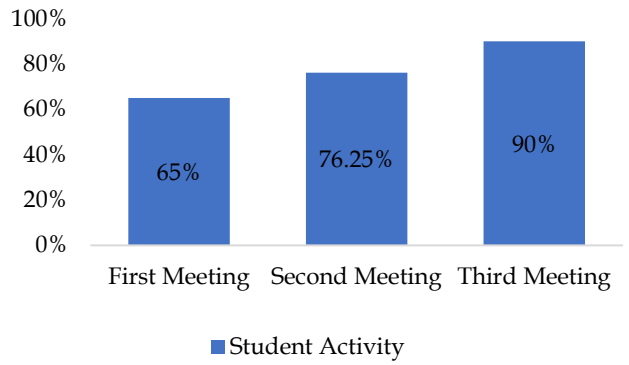

Figure 3. Percentage of Student Activity

Based on Figure 3, the percentage of student activity at the first meeting was 65%, at the second meeting was 76.25%, and at the third meeting was 90%. At the first meeting, there were still 30% of students who had low activity. This is because students have not adapted to learning using the Problem-Based Learning Model. At the second meeting, the activity of the students started to increase because the students began to be able to adapt and feel interested in learning using the Problem-Based Learning Model assisted by Microsoft Sway. At the third meeting, many students were active during learning. This shows that the activity of students at each learning meeting in the experimental class has increased. So, it can be concluded that learning using the Microsoft Sway-assisted Problem-Based Learning Model can increase student activity. This is in line with research conducted by (Gandasari & Setyasto, 2021; Handaningtyas, 2023; Pramudya et al., 2019) which states that the Problem-Based Learning Model can increase the activity and learning outcomes of elementary school students in science.

Research that supports problem-solving in this study includes (1) research conducted by (Dewi & Wulandari, 2019) with the results of the Problem-Based Learning Model more effective in science learning outcomes compared to direct learning models; (2) research conducted by (Gandasari & Setyasto, 2021) with the results of the Problem-Based Learning Model assisted by Microsoft Sway is effectively used and can improve Civic Education learning outcomes; (3) research conducted by (Raharjo et al., 2020) with the results of using the Problem-Based Learning Model assisted by Media Sway in Thematic learning can increase students' learning motivation.

Conclusion

Based on the results and discussion in this study, it can be concluded that the Problem-Based Learning Model assisted by Microsoft Sway is effective compared to the Direct Instruction Model for science learning outcomes in fifth grade elementary school of Gugus Kartini Mejobo Kudus. In addition, learning that uses the Microsoft Sway-assisted Problem-Based Learning Model is able to improve learning outcomes and activities of fifth grade students at elementary school of Gugus Kartini, Mejobo District, Kudus Regency. This is based on the results of testing the hypothesis with the t test and the average increase test (N-gain).

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