

Seroid E-Module on Electrical Material on Learning Outcomes of Class VI Elementary School Students

Azizah¹, Melyani Sari Sitepu^{2*}, Karmila³ 

^{1,2,3} Universitas Muhammadiyah Sumatera Utara, Medan, Indonesia

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ABSTRAK

Dalam proses pembelajaran, media pembelajaran yang tersedia kurang memadai dan masih terbatas khususnya pada mata pelajaran IPA karena hanya menggunakan buku paket dan sesekali melakukan praktek sederhana. Tujuan penelitian ini adalah untuk menganalisis efektivitas E-Modul Serli berbasis Android (E-Modul Seroid) pada materi listrik terhadap hasil belajar siswa kelas VI sekolah dasar. Penelitian ini merupakan penelitian eksperimen yang dilakukan pada dua kelompok yaitu kelompok eksperimen dan kelompok kontrol. Desain penelitian yang digunakan dalam penelitian ini adalah control group Pre-test Post-test design. Subyek pada penelitian ini yaitu siswa kelas VI SD sebanyak 35 siswa. Instrumen yang digunakan adalah instrumen tes yaitu soal pilihan ganda yang telah diuji validitas dan reliabilitasnya. Analisis data menggunakan uji persyarat yaitu uji normalitas dan uji homogenitas serta pengujian hipotesis menggunakan paired sample t-test berbantuan SPSS For Windows 25. Berdasarkan hasil penelitian ini menunjukkan penggunaan E-Modul Seroid pada materi listrik efektif digunakan terhadap hasil belajar siswa. Jadi dapat disimpulkan bahwa E-Modul Seroid pada materi listrik dapat digunakan untuk meningkatkan hasil belajar siswa kelas VI Sekolah Dasar.

ABSTRACT

The available learning media still need to be improved and still limited in the learning process, especially in science subjects, because they only use textbooks and occasionally do simple practices. This study aimed to prove the effectiveness of the Serli E-Module based on Android (Seroid E-Module) on electricity subject to the learning outcomes of sixth-grade elementary school students. This research is conducted in two groups: the experimental group and the control group. The research design used in this study was the control group pre-test and post-test design. The subjects in this study were 35 students of sixth-grade elementary school. The instrument used is a test instrument, namely multiple choice questions tested for validity and reliability. Data analysis used the conditional test, namely the normality and homogeneity tests, and hypothesis testing using the paired sample t-test assisted by SPSS For Windows 25. The results of this study show that the use of Seroid E-Modules in electricity material is effectively used on student learning outcomes. So, it can be concluded that the Seroid E-Module on electricity material can be used to improve the learning outcomes of class VI elementary school students.

1. INTRODUCTION

Modules are teaching materials that include learning objectives, instructions for use, material descriptions, summaries, evaluations, feedback, and follow-up that can be used in learning and can support the effectiveness of the learning process (Kurniawati, 2020; Ummah et al., 2020). According to previous research, a module is a form of teaching material designed to enable students to learn independently (Imran et al., 2021; Lestari & Parmiti, 2020). As time goes by, the development of modules has been changed to electronic modules, better known as e-modules, which can make it easier for students to access various learning materials that can display/load images, video, audio, and animation. The e-module can be accessed anywhere, both at home and school. Electronic modules (E-modules) are the development of printed modules in digital form that are presented in electronic form, resulting in E-Modules that are equipped with text, images, and videos (Dewi & Lestari, 2020; Hakim et al., 2020; Sugihartini & Jayanta, 2017). E-modules

are digital-based learning media accessed via computers, laptops, and cell phones. Using E-modules in learning can help students overcome difficulties in learning, help them learn independently, and measure their level of understanding so that learning can take place effectively. Using E-modules, teachers act as learning facilitators who will facilitate students in the learning process, especially teachers who need to facilitate students in science learning so that learning activities can run effectively (Citrawathi et al., 2016; Hadiyanti, 2021). IPA is a main subject in elementary school. Science is a natural learning concept with a very broad relationship related to human life, which plays a very important role in the educational process and supports technological development progress (Aswir & Misbah, 2018; Melinda, T., et al., 2021). Science learning is a place for students to learn about themselves and the natural world around them, which can be obtained through activities in the form of facts, concepts, and theories that are applied in everyday life (Imran et al., 2021; Panjaitan, 2017; Wulandari et al., 2021). Apart from using E-modules in science learning, it must also be supported by an appropriate, interesting learning approach that activates students in the learning process. One learning model that is by this is the discovery learning model. The discovery learning model is a learning model that can increase students' knowledge to become more meaningful in searching for new ideas so that initially passive learning conditions become more active and creative (Ana, 2019; Azizah & Winarti, 2018). The discovery learning model is an alternative learning model that teachers can apply so that students are actively involved in discovering for themselves a concept or principle they do not yet know (Anggelina & Harjono, 2022; Prilliza et al., 2020). The discovery learning model makes students more active and independent in searching for material, solving problems, and finding a conclusion from learning. The discovery learning learning model emphasizes the formation of student knowledge from experience during learning. The main characteristics of the discovery learning model are: (1) exploring and solving problems to create, combine, and generalize knowledge; (2) centered on students; (3) activities to combine new knowledge and existing knowledge (Fajri, 2019; Sumianingrum, 2017).

Discovery learning is effectively used in science learning, which will be presented as an E-module. Discovery learning e-modules can increase students' enthusiasm for learning because they are equipped with interesting videos and images to think critically and get concepts independently (K. W. B. Putra et al., 2017; Saparuddin, 2021). E-modules are expected to become a new learning resource for students, which can improve student learning outcomes. Using the Serli E-Module in learning makes students active and independent in carrying out experiments so that they discover concepts, understand the material, and solve problems. It follows the advantages of the Serli E-module according to previous research: (1) helping teachers and students carry out learning that is competent in conducting experiments; (2) learning becomes more meaningful because students discover their knowledge from the experiments they have carried out; (3) students become active and independent in carrying out experiments; (4) students can discover concepts from the material studied; (5) students can understand the material and solving problems; (6) students feel happy because they have succeeded in discovering new concepts and solving their problems; (7) students become interested in studying science because science is useful in everyday life; (8) students have a positive view of science and scientists (Thalib et al., 2020).

Based on the results of initial observations by researchers at schools with sixth-grade teachers, it was found that the minimum completeness score specifically for science learning that students must achieve is 70. The highest score for science subjects for class VI A students is 100, and the lowest is 65. Data on student learning outcomes shows that of the 24 students, only around 87.5% got a score above the minimum completeness criteria (KKM), and around 12.5% got a score below the minimum completeness criteria, while for class VI B, the highest score was 90 and the lowest score was 75. Data on student learning outcomes is shown for the 24 students. Only around 87.5% got a score above the minimum completeness criteria (KKM), and around 12.5% got below the minimum. Based on the explanation from the sixth-grade teacher, data was obtained that in learning science, we used theme books and occasionally carried out simple practices depending on what material was suitable for the practice. However, the available learning media must be completed and adequate, especially in science subjects. The electricity material in sixth-grade elementary school is about components, functions, circuits, and examples of electricity use. The results of initial observations at the Bureau Elementary School stated that simple practices regarding electricity were often carried out at the elementary school. However, the media they used still needed to be improved. This practice is carried out only with the help of student books and worksheets. There is no help with other learning media apart from these two media. Science learning is less effective because students need help understanding the material and are less motivated to learn. Electricity can flow through cables, which makes them easy to move. There are two types of electric charges: positive and negative. It is important to focus on selecting teaching materials in the learning process to make learning activities more effective and meaningful.

The Android-based Serli E-Module (Seroid E-Module) will make it easier for teachers and students to learn science, especially in material that allows for online learning or distance learning. The Seroid E-

Module is independent teaching material containing learning objectives, material summaries, and practical activities to prove natural phenomena arranged systematically into certain learning units. The Seroid e-Module was designed to be a tool for students to learn independently without guidance from a teacher with teaching materials that can improve and train students' knowledge. From the explanation above, researchers will research the effectiveness of the Android-based E-Modul Serli (E-Modul Seroid) in electrical material on the learning outcomes of sixth-grade elementary school students.

2. METHOD

This research is conducted on two groups: the experimental group and the control group. The research design used in this research is experimental in the form of a control group pre-test and post-test design. The design is shown in [Table 1](#).

Table 1. Pre-Test Post-Test Design

Group	Pre-Test	Treatment	Post-Test
KE	O ₁	X ₁	O ₂
KK	O ₃	X ₂	O ₄

Description :

KE = Experiment Class

Kk = Control Class

O1 = Pre-Test in the Experimental Class

O2 = Post-Test in the Experimental Class

O3 = Pre-Test in the Control Class

O4 = Posttest in the Control Class

X1 = Learning using Seroid E-Module

X2 = Learning using Thematic Books

This research was carried out in the sixth grade of the SDN Bureau, located on Gelatik Street, North Bureaubuli Village, South Palu District, Palu City. This research was conducted in November 2022. The research subjects used in this research were all sixth-grade students at SDN Bureau for the 2022/2023 academic year, totaling 35 students. The sample used in this research was 16 students in class VI A and 19 in class VI B. The data collection technique used in this research is collecting data on learning outcomes using tests. Tests were carried out before and after treatment. The test is in the form of multiple choice questions with 17 questions whose validity and reliability have been tested.

The data analysis technique in this research uses descriptive statistics and test requirements, namely normality test, homogeneity test, and hypothesis testing using paired sample t-test, which is analyzed using SPSS for Windows 25. Research variables are anything in whatever form the researcher determines to be studied so that information is obtained about this matter, and then conclusions are drawn. This research involves two variables, namely the independent variable and the dependent variable. According to the independent variable or independent variable, it is a variable that influences or is the cause of the change or emergence of the dependent variable. In contrast, the dependent variable or dependent variable is a variable that is influenced or is the result of the independent variable ([Sugiyono, 2018](#)). The independent variable in this research is (The android-based Serli E-Module) while the dependent variable is student learning outcomes in the cognitive domain (knowledge). The data analysis technique used in this research is the t-test with the help of SPPS For Windows 25.

3. RESULT AND DISCUSSION

Result

The research results were obtained from the Pre-test and Post-test activities carried out. Before being given treatment, both classes were first given a pre-test. The experimental class was given treatment using the Seroid E-Module in the learning process, while the control class was given treatment using books or LKS. The descriptive analysis results, carried out using SPSS For Windows 25, aim to provide an overview of the data collected from the experimental and control classes. After each class was treated, both classes were given a post-test. The pre-test results of the experimental and control classes of sixth-grade students at SDN Bureau can be seen in [Table 2](#).

Table 2. Data on Pre-Test Results in the Experimental Class and Control Class

Statistic	Pre-Test Data	
	Experiment Class	Control Class
Mean	55,74	55,25
Minimum Score	35	35
Maximum Score	70	65

Based on the data in Table 2, it can be seen that the average (Mean) for experimental class students is 55.74, while the control class has an average of 55.25. The pre-test results for the experimental class obtained a minimum score of 35 and a maximum score of 70, while the control class obtained a minimum score of 35 and a maximum score of 65. The post-test results for the experimental and control classes for class VI students at SDN Bureau can be seen in Table 3.

Table 3. The Post-Test Results for the Experimental and Control

Statistic	Post-Test Data	
	Experiment Class	Control Class
Mean	82,68	78,81
Minimum Score	65	53
Maximum Score	100	100

Based on the data in Table 3, the post-test results in the experimental class whose learning used the Seroid E-Module obtained an average score of 82.68 with a minimum score of 65 and a maximum score of 100, while in the control class, which used books and worksheets an average score of 78 was obtained. .81 with a minimum score of 53 and a maximum score of 100. The results of the analysis show that there is a difference in the average value of student learning outcomes between the experimental class and the control class. The student learning outcome scores in the experimental class were higher than the average score of students in the control class. Next, the normality test on the pre-test data is used to test whether a data distribution is normal. The test criteria used to measure normality in this research are that H_a is accepted if the significance value obtained is $>$ the specified α level, namely 5% (0.05). To test the normality of the residual distribution of pre-test scores for the experimental and control classes, it can be analyzed using the Kolmogrov-Smirnov formula with the help of calculations using the SPSS For Windows 25 program. The results of the data normality test for the experimental and control classes can be seen in Table 4.

Table 4. Normality Test Results

Class	Kolmogrov-Smirnov		
	Statistic	Df	Sig.
Experiment	0.170	19	0.149
Control Class	0.200	16	0.087

Based on the data in Table 4, the significance value in the experimental class is 0.149, which is greater than the specified α level ($0.149 > 0.05$). It means H_a is accepted and H_o is rejected, which means the residual data is normally distributed. Meanwhile, for the control class, the significance value is 0.087, greater than the specified α level ($0.087 > 0.05$). It means H_a is accepted and H_o is rejected, which means the residual data is normally distributed. The homogeneity test aims to determine whether a data variant is homogeneous. The homogeneity test was carried out using the SPSS For Windows 25 program. The results of the data homogeneity test for the experimental class and control class can be seen in Table 5.

Table 5. Homogeneity Test Results

	Levene Statistic	df 1	Df 2	Sig.	
Learning Outcomes	Based on Mean	0.008	1	32	0.930
	Based on Median	0.018	1	32	0.894
	Based on the Median and with Adjusted df	0.018	1	29,948	0.894
	Based on Trimmed Mean	0.007	1	32	0.933

Based on [Table 5](#), the significant value (Sig.) obtained in the experimental and control classes is 0.930, which means that the value is $0.930 > 0.05$, so the data meets the homogeneity assumption. It means that the population studied has similarities. Hypothesis testing is carried out to prove the truth of the hypothesis that has been formulated and draw conclusions on whether to accept or reject the statement—testing the effectiveness of the Android-based E-Modul Serli (E-Modul Seroid) on electrical material on the learning outcomes of sixth-grade students at SDN Bureau using Paired Sample T-Test analysis via the SPSS For Windows 25 program. The results of the Paired Sample T-Test test can be seen in [Table 6](#).

Table 6. Results of Paired Sample T-Test Analysis

		Paired Differences					T	Df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence interval of the Difference				
					Lower	Upper			
Pair 1	Pre-test Experiment	67.711	16.551	2.685	62.270	73.151	25.219	37	0.000
	Post-test Experiment								
	Experiment								

Based on [Table 6](#), there is a Paired Sample T-Test significance value of $0.000 < 0.05$. Because the significance value of the t-test $< \alpha$ is $0.000 < 0.05$, H_a is accepted, and H_o is rejected. So, it can be concluded that the Android-based E-Modul Serli (E-Modul Seroid) is effectively used in electricity material on the learning outcomes of sixth-grade students at SDN Bureau.

Discussion

Based on the results of hypothesis testing, the Android-based E-Modul Serli (E-Modul Seroid) is effective for use in electrical material on the learning outcomes of sixth-grade students at SDN Bureau. The Android-based Serli E-Module (E-Modul Seroid) is effectively used in electrical material on the learning outcomes of sixth-grade students at SDN Bureau, as shown by the t-test significance value being smaller than α ($0.000 < 0.05$), meaning that the use of the Serli E-Module Based on Android (E-Modul Seroid) it is effectively used in electricity material on the learning outcomes of sixth-grade students at SDN Bureau. The effectiveness of the Android-based E-Modul Serli (E-Modul Seroid) in electrical material on the learning outcomes of sixth-grade students at SDN Bureau is also demonstrated by the Post-test activities carried out at the end of the lesson. The Experiment class group had an average Post-test score of 82.68, and the Control class group had an average Post-test score of 78.81. The use of the Seroid E-Module in electricity material is likely effective for the learning outcomes of sixth-grade students at SDN Bureau. In line with this, research conducted by other researchers states that E-Modules based on flipbook applications are effective in the thematic learning process ([Kumalasani & Eilmelda, 2022](#)). Other researchers stated that the Android-based interactive e-Module Mathematics teaching materials effectively increased the understanding of circles in sixth-grade elementary schools ([Murod et al., 2021](#)). This is shown by the difference in the average score of student learning outcomes in the post-test of the experimental class, which used the E-Module Seroid in the science learning process, and the control class, which used book media in science learning. In line with the understanding of learning outcomes put forward in his research, learning outcomes are increased abilities, competencies, and skills obtained by students after following a learning process that includes cognitive, affective, and psychomotor aspects ([Masruroh & Agustina, 2021](#); [Novita et al., 2019](#); [Putri et al., 2021](#)).

Research states that E-modules can be the best alternative for understanding and studying learning material by developing a learning process not only by reading textbook style but also by using several other methods ([Padwa & Erdi, 2021](#); [Pramana et al., 2020](#)). Learning can take place effectively using E-Modules because it can allow students to access teaching materials ([Suharyat, Y., & Gunawan, R. G. 2023](#); [Wulansari et al., 2018](#)). E-Modules in learning can help students overcome difficulties in learning, help them to learn independently, and measure their level of understanding so that learning can take place effectively. According to E-Modules, they have advantages compared to printed modules. Their interactive nature makes navigation easier. They can display or load images, audio, video, animation, and formative tests, allowing immediate automatic feedback ([Putra, Y. P., & Musril, H. A. 2022](#); [Thalib et al., 2020](#)). Before carrying out the learning process, give Pre-test questions to both classes, namely the control and experimental classes. The purpose of giving a pre-test is to determine students' initial abilities before the

learning process is carried out and to obtain an average score from both classes. After the pre-test is given, the next step is to carry out the learning process in the control and experimental classes by providing different treatments but still using the same material, electricity. The steps in the Serli E-Module implement the learning process in the experimental class and are also adjusted to the learning process design (RPP). At the beginning of learning, students are directed on how to operate using the Serli E-Module. Students form a group to read the lesson material in the Serli E-Module together, equipped with photos and learning videos to increase students' interest in learning and make learning more interactive. Apart from that, students carry out practicum activities, which make students more active in participating in learning, students' enthusiasm for learning increases, and learning becomes more interactive. It triggers their curiosity so that learning outcomes improve. E-Modul Serli is an Android-based electronic module (E-Modul Seroid) with a discovery learning approach, namely learning with the characteristics of the teacher's role as a guide, students learn actively as scientists, teaching materials are presented in the form of information and students carry out collecting activities, compare, categorize, analyze and make conclusions (Akkus et al., 2007; Setyawati, 2018). According to other research, through the Discovery learning approach, students become active and independent in carrying out experiments, which ultimately allows students to discover a concept, understand the material, solve problems, and make their conclusions on the material they have studied (Azizah et al., 2022; Thalib et al., 2020).

Research carried out on sixth-grade students at SDN Bureau in the learning process using the Android-based Serli E-Module. The e-module used focuses on science lessons, especially electricity. When using the Serli E-Module, students are invited to read the lesson material in the Serli E-Module, which is equipped with photos and learning videos that can increase students' interest in learning. Students also carry out practical activities that make them more active, increase their enthusiasm for learning, and trigger their curiosity to improve learning outcomes. The advantages and disadvantages of using the Android-based E-Modul Serli (E-Modul Seroid) according to other research are: (1) Increasing students' motivation and enthusiasm for learning when working on tasks that are clearly defined and according to their abilities; (2) after the assessment is carried out, teachers and students know which modules the students were successful in and which modules the students were not successful in; (3) Helping teachers and students when carrying out learning where they are competent in conducting experiments; (4) Students discover their own knowledge from the experiments they have carried out so that the learning process becomes more interesting; (5) Students become active and independent in carrying out experiments; (6) Students solve their own problems and can discover concepts from the material studied themselves; (7) Students' interest in science increases because science is very useful in everyday life so they have a positive view of science and scientists (Mentu & Azizah, 2022; Rahayu et al., 2022). Apart from that, the weaknesses of using the Android-based E-Modul Serli (E-Modul Seroid) are: (1) It is better to use it in groups because experimenting in groups will produce diverse concepts; (2) Not all students can understand the experimental procedures in the module, for this reason a high degree of perseverance is needed from the teacher to help the students; (3) The module cannot be used for all materials; (4) internet is required to access the Seroid E-Module. Based on these limitations, it is recommended that further researchers develop emodules for other materials that have practical competence and develop emodules that can be used offline.

4. CONCLUSION

Based on the research that has been carried out, the results of accepting H_a and rejecting H_0 can be obtained to conclude that using the Seroid E-Module is effective in electrical material on the learning outcomes of sixth-grade elementary school students.

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