



# The Effect of Flip PDF Corporate E-Module on Mathematical Concept Understanding of Sixth Grade Elementary School Students

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## Abstrak

Terdapat permasalahan mengenai rendahnya pemahaman siswa mengenai konsep luas permukaan dan volume bola. Diperlukan sistem media pembelajaran yang inovatif untuk meningkatkan pemahaman konsep matematika siswa. Penelitian ini bertujuan untuk menganalisis pengaruh penggunaan e-modul Flip PDF Corporate terhadap pemahaman siswa pada konsep luas permukaan dan volume bola. Penelitian kuantitatif ini menggunakan metode eksperimen semu dengan Pretest – Posttest Control Group Design. Teknik pengumpulan data dalam penelitian ini meliputi tes, angket, dan observasi. Populasi penelitian ini terdiri dari siswa kelas VI Sekolah Dasar Negeri. Sampel penelitiannya adalah 15 siswa kelompok eksperimen dan 13 siswa kelompok kontrol yang semuanya berasal dari kelas VI Sekolah Dasar Negeri. Kelompok eksperimen mendapat perlakuan berupa e-modul Flip PDF Corporate dan kelompok kontrol hanya diberikan buku teks pelajaran. Instrumen tes terdiri dari 10 soal pilihan ganda. Data dianalisis menggunakan uji T dengan bantuan software SPSS. Hasil uji T-test terdapat pada kolom Sig. (2-tailed) menunjukkan nilai p signifikan sebesar 0,024. Hal ini menunjukkan bahwa  $H_0$  ditolak dan terdapat perbedaan hasil post-test yang signifikan antara kelompok eksperimen dan kelompok kontrol. Dengan kata lain penggunaan e-modul Flip PDF Corporate berpengaruh terhadap kemampuan siswa dalam memahami konsep luas permukaan dan volume bola pada kelas VI Sekolah Dasar Negeri.

**Kata Kunci:** E-Modul, PDF Flip Corporate, Konsep Matematika

## Abstract

There is an issue concerning the low understanding of students regarding the concepts of surface area and volume of a sphere. Innovative learning media system is needed to increase students' understanding of mathematical concepts. This study aims to analyze the effect of the use of the Flip PDF Corporate e-module on students' understanding of the concept of surface area and volume of a sphere. This quantitative research study used a quasi-experimental method with the Pretest - Posttest Control Group Design. The data collection techniques in this research include tests, questionnaires, and observations. The population of this study consists of sixth-grade students from State Elementary School. The research sample includes 15 students from the experimental group and 13 students from the control group, all of whom are from the sixth grade of State Elementary School. The experimental group received treatment in the form of the Flip PDF Corporate e-module and the control group was only given textbooks. The test instrument consisted of 10 multiple-choice questions. Data were analyzed using T-test with the help of the SPSS software. The results of the T-test are in the Sig column. (2-tailed) showed a significant p-value of 0.024. This indicates that  $H_0$  is rejected and there is a significant difference in the post-test results between the experimental and the control groups. In other words, the use of Flip PDF Corporate e-module affects the student's ability to understand the concepts of surface area and volume of a sphere in the sixth grade of State Elementary School.

**Keywords:** Flip PDF Corporate, e-Module, Mathematical Concepts

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## 1. INTRODUCTION

Education is academic learning activities carried out effectively, efficiently, and openly for the public based on the value of academic understanding achievement and academically responsible for the information provided through the formal or informal system from the teaching team to the students (Ho, 2015; Tan et al., 2020). Learning activities cover the process of conveying information or knowledge from teachers to students, including information about mathematics. Mathematics is a fundamental sub-teaching material as the

basis for studying other scientific fields. As a science, mathematics equips students with mathematical abilities such as counting that can be applied in daily life (Sukardjo & Salam, 2020; Zubaidah, 2019). Understanding a concept map regarding the learning material is important as it can be the key to success in achieving the expected learning goals in schools. Besides, conveying an appropriate understanding of concepts can help students have mathematical abilities and solve mathematical problems (Van de Weijer-Bergsma & Van der Ven, 2021; Verschaffel et al., 2020). Understanding the concept is the student's ability to understand the materials and affects students' ability to present the materials as well as to apply what has been learned.

Mathematical understanding covers three aspects, namely translating, interpreting, and exploring. Translating is the level of students' understanding in applying the ability to interpret common concepts in a more complex and focused (Damyanov & Tsankov, 2018; Lestari & Surya, 2017). Interpreting is students' ability to analyze and understand the main ideas of learning in order to distinguish between the justification and rejection of materials presented. Exploring is students' ability to make predictions in order to explain in detail (Heidari & Ebrahimi, 2016; Templier & Paré, 2015). The parameters of the level of understanding of mathematical concepts are in the form of interpretation, re-explanation of a concept, applications, academic representation, and achievement in maximizing certain paths.

Learning processes have three main constituents, namely teachers, students, and learning resources. The process of conveying information and knowledge requires certain learning media to help students understand. Students perceive mathematics subjects as difficult and abstract in nature with their numbers and symbols (Ismiarti & Nikmah, 2021; Yustitia et al., 2021). Besides, it requires a certain level of intelligence and reasoning so students are less interested in it. Teachers have key roles in the continuity of the teaching and learning process. They have to create an effective classroom atmosphere and increase students' understanding, attention, and interest in learning. Besides, they have to innovate using interesting learning media to help students actively participate and easily understand mathematical concepts. Along with the development of technology, teachers are required to be innovative and effective by utilizing innovative learning media and creating pleasant classroom conditions (Harahap et al., 2021; Rambe et al., 2021). It is in line with previous study that the process of learning mathematics requires innovative and creative teachers (Shanks et al., 2017).

During the covid-19 pandemic, learning activities highly depend on the available technology. The development of Information Computers and Technology cannot be separated from the modern era (Astini, 2020; Shanks et al., 2017). The implementation of remote or distance learning is a way to stop the spread of the virus. This requires learning models, methods, and strategies to increase students' interest in understanding mathematical material without the need to memorize both material and formulas but they are expected to understand the core concepts of the material being studied (Anggraini & Zulkardi, 2020; Fatimah & Santiana, 2017; Safdar et al., 2012). Previous studies on sixth-grade elementary school students reveal that the mathematical learning process was only through WhatsApp groups in which teachers shared the learning materials in the form of videos and assignments (Yıldırım, 2016).

Thus, students only focused on learning using electronic devices such as handphones instead of using printed books. They searched for the reference for the materials from the internet only. Thus, innovative learning media are needed to help students think creatively and increase students understanding of the concepts (Hutagalung & Purbani, 2021; Muhali, 2019). Therefore, this study focuses on developing an interesting and attractive e-module that can be accessed via handphone with the help of the Flip PDF Corporate application. E-module is a form of a module that is presented through electronic devices such as handphones

or tablets (Anggraeni & Puspasari, 2022; Erniwati, 2022). The use of e-modules in distance learning or online learning becomes a good solution due to its efficiency and comfortable without the need to flip back the printed text. E-modules are considered innovative and needed because they are practical and contain complete material.

Based on the results of observations at State Elementary School Sardonoarjo 1 during the Covid-19 pandemic, students focused on doing mathematical assignments given through the WhatsApp group. They did not understand the material in depth as proven by the results of the test of surface area and volume of sphere with an average score of 70.5 or below the minimum completeness criteria. Besides, they had problems accessing learning material and some look for materials on the internet to get the answer instantly which makes them lazy to learn. The results of interviews with the teacher for the sixth grade, the school had not utilized technology-based learning media to support online learning. Furthermore, there is an issue concerning the low understanding of students regarding the concepts of surface area and volume of a sphere. This is indicated by the students' inability to interpret problems related to the surface area and volume of a sphere and solve them, their lack of ability to convert a problem into symbols, and their inability to apply the concepts of surface area and volume of a sphere in mathematical calculations.

Based on the explanation above, an innovative learning media system is needed to increase students' understanding of mathematical concepts. This is in line with that students' interest in the use of the Flip PDF Corporate e-module is due to its innovative and effective performance (Nisa et al., 2020). Therefore, this study will develop instructional media in the form of e-modules using the Flip PDF Corporate application regarding the surface area and volume of the sphere for sixth-grade students in elementary schools to help them increase their conceptual understanding. The objective of this research is to create the Flip PDF Corporate e-module and analyze its influence on improving students' understanding of the concepts of surface area and volume of a sphere. Therefore, this study contributes to the investigation of the development of the Flip PDF Corporate e-module and its effectiveness in enhancing students' understanding of the concepts of surface area and volume of a sphere in the sixth grade of State Elementary School 1 Sardonoarjo.

## 2. METHODS

This quantitative study used a quasi-experimental method. Quasi-experimental method has a control group, but cannot fully function to control external variables that affect the implementation of the experiment (Sugiyono, 2019). The population of this study was all sixth-grade students of State Elementary School 1 Sardonoarjo. The sample consisted of 15 students in the experimental group and 13 students in the control group with purposive sampling technique. This research utilizes a Pretest-Posttest Control Group Design, which is illustrated in Figure 1.

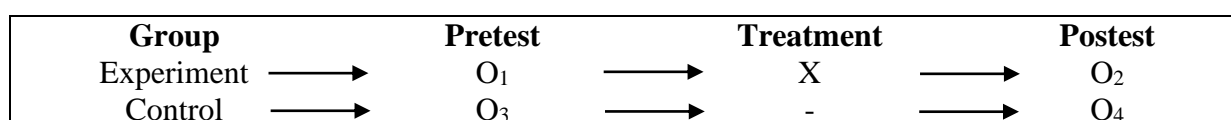


Figure 1. Pretest - Posttest Control Group Design

This study used a Pretest - Posttest Control Group Design with two categories of groups that were given a pretest to examine the initial conditions and whether there are differences in the experimental and the control groups. The experimental group received the Flip PDF Corporate (X) e-module while the control group was given textbooks. The treatment effect is  $(O_1 - O_2) - (O_3 - O_4)$ .

Data were collected through tests, questionnaires, and observation. The test was given before treatment in the pretest form and after treatment in the post-test form. The test consisted of 10 multiple choices about the surface area and volume of the sphere. The questionnaire was to find out the students' responses after the learning.

Students' responses in the form of a Likert scale were analyzed further by calculating the average value of the total score. The Likert scale consisted of strongly agree, agree, disagree, and strongly disagree. Observations were to find out the teaching and learning system using the Flip PDF Corporate e-module media. The validation of research instruments was conducted using the Product Moment correlation technique, as shown in [Table 1](#).

**Table 1. Validity Testing Results**

Item Number	Correlation	Significance
1	0.726	Highly Significant
2	0.632	Significant
3	0.741	Highly Significant
4	0.767	Highly Significant
5	0.788	Highly Significant

Based on the validity results in [Table 1](#), it can be concluded that all items in the instrument have been deemed valid. Additionally, the reliability coefficient of the test, which consists of descriptive questions, was calculated using the Alpha-Cronbach formula, yielding a result of 0.82. This indicates that the instrument's trial results have a high level of reliability.

To determine the effect of the use of e-module on students' conceptual understanding, a one-tailed t-test was carried out in both groups. If the test scores obtained are different and the score is in a large category, it is considered good learning media. Thus, if the average score of the experimental group is higher than the control group, the Flip PDF Corporate e-Module is considered effective. The data analysis technique used in this research is inferential statistical analysis of parameters, which is carried out using the t-test.

### 3. RESULTS AND DISCUSSION

#### Result

The test of the effect of the use of the Flip PDF Corporate e-module on the mathematical understanding of the surface area and volume of the sphere was carried out on 15 students in the experimental group and 13 students in the control group. The analysis used a t-test with the help of the SPSS software. The results of the hypothesis testing tested in this study are presented in [Table 2](#).

**Table 2. Normality Test using the Kolmogorov-Smirnov for Experimental and Control Groups**

	Group	Kolmogorov Statistic	df	Smirnova Sig.	Statistic	Shapiro-df	Wilk Sig.
Mathematics Learning Outcomes	Post-Test experimental	0.131	15	0.200	0.948	15	0.491
	Post-Test control	0.119	13	0.200	0.973	13	0.922

Based on Table 2 show results of the analysis in the Kolmogorov-Smirnov test, the asymp.sig value was in the category of df 15 with a value of  $0.200 > 0.05$  (significance). This means that the post-test data of the experimental group are normally distributed. The results of the analysis in the control group obtained asymp.sig value was in the category of df 13 with a value of  $0.200 > 0.05$ . This means that the post-test data in the control group are normally distributed. Thus, the data of both groups are considered normally distributed. The result of homogeneity test is show in Table 3.

**Table 3. Homogeneity Test**

		Levene Statistic	df <sub>1</sub>	df <sub>2</sub>	Sig.
Mathematics Learning Outcomes	Based on Mean	1.210	1	26	0.281
	Based on Median	1.001	1	26	0.326
	Based on Median and with Adjusted df	1.001	1	23.726	0.327
	Based on Trimmed Mean	1.199	1	26	0.283

Based on the SPSS output value obtained as show in Table 3, the asymp.sig value is  $0.283 > 0.05$ . This means that the post-test data to calculate the level of students' mathematical ability in the two groups are declared homogeneous. The result of T-test is show in Table 4.

**Table 4. Results of T-test**

Group		Levene's Test for Equality of Variances		t	Df	t-test for Equality of Means			95% Confidence Interval of the Difference	
		F	Sig.			Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
		Post K-E	Equal variances assumed			7,197	0,009	2,447	59	0,017
Post K-E	Equal variances not assumed	7,197	0,009	2,347	41,698	0,024	-8,999	3,834	-16,738	-1,260

Base on Table 4 show the results of the analysis using the Independent Sample T-Test by assessing the Sig column. (2-tailed) in the Equal variances not assumed, the p-value is 0.024. The value of  $0.024 < 0.05$  indicates that  $H_1$  is accepted /  $H_0$  is rejected and there is a significant difference in the posttest results in the experimental and the control groups. Therefore, there is a significant relationship between the use of Flip PDF Corporate on the conceptual understanding of the sixth-grade students of State Elementary School Sardonoharjo 1.

This study was to identify the effect of Flip PDF Corporate on the level of understanding of the mathematical concept of the sixth-grade students of State Elementary School Sardonoharjo 1. In the post-test, students were given 10 multiple choices related to factors influencing the concept of mathematics, namely restating the concept, giving examples and non-example, presenting conceptual forms in various representations, increasing the conditions for a concept, and carrying out, utilizing and choosing certain paths and operations. The measurement of students' conceptual understanding used five indicators.

Referring to Bloom's Taxonomy, understanding is in the C2 cognitive range by providing an understanding of translation (the ability to translate a symbol into another form),

interpretation (the ability to present material), and extrapolation (the ability to explain broad meanings). The posttest was carried out in the experimental and control groups. The experimental group was asked to fill out questionnaires. Students can have conceptual understanding if they can understand the surface area and volume of the sphere. The result of comparison of experimental and control is show in [Table 5](#).

**Table 5.** Comparison of Students' Understanding of the Experimental Class and the Control Class

Score	Experimental group		Control group	
	X	% Completeness	X	% Completeness
Post-Test	84.3	93.33 %	77.7	69.23%

## Discussions

Previous study explain that learning media play a major role in influencing the level of students' understanding of the material and help to facilitate the delivery of knowledge as well as grow interested in learning ([Antika & Suprianto, 2016](#)). In the experimental group, the average score is higher than the control class due to the different treatments provided. In the experimental group, learning media used Flip PDF Corporate which is more interesting as it is completed with pictures and videos to attract students' interest ([Erniwati, 2022](#); [Fairuzi, O., & Bentri, 2021](#)).

Besides, based on the percentage of student completeness, 14 out of 15 students in the experimental group had a completeness percentage of 93.3%. Meanwhile, 9 out of 13 students in the control group had a completeness percentage of 69.23%. Based on the completeness of data, the treatment in the form of Flip PDF Corporate learning media influenced students' understanding of concepts. Students can easily solve mathematical problems when they understand mathematical concepts well and can relate mathematical concepts to be fundamental to mathematics learning activities. This is consistent with the findings of previous study which showed that the development of e-modules using Flip PDF Corporate Edition can effectively improve students' learning achievement ([Simanihuruk & Hia, 2022](#)). In the development of e-modules using Flip PDF Corporate Edition, it is essential to ensure practicality and suitability for use ([Anggraeni & Puspasari, 2022](#); [Dewi, 2023](#); [Zinnurain, 2021](#)).

The results of this study are in line with the development of E-Modules using the Kvisoft Maker system has a positive effect on the student's level of boredom in the classroom ([Putri et al., 2020](#)). Besides, the system implemented can increase the level of students' understanding of the material. The use of digital Flip PDF Corporate learning media for surface area and volume of the sphere in mathematical learning in sixth-grade students is effective in providing students with an understanding of the concept ([Nurasni et al., 2023](#); [Octaviani & Desyandri, 2023](#)). It is in line with other study that the use of digital flipbook media makes it easier to deliver materials by using features that students like in the form of pictures, animations, videos, and audio in order to increase the level of student understanding ([Kodi et al., 2019](#)).

Based on the above research findings, it can be concluded that the development and use of the Flip PDF Corporate e-module have effectively contributed to improving the understanding of sixth-grade students at SD Negeri Sardonoharjo 1 in the concepts of surface area and volume of a sphere. The impact of the Flip PDF Corporate e-module aligns with the findings who developed a Flip PDF Corporate-based e-module on the topic of surface area and volume of a sphere, which was considered suitable, practical, and effective ([Susanti & Sholihah, 2021](#)). Furthermore, the use of the Flip PDF Corporate e-module has been shown to enhance students' interest, learning outcomes, and learning achievement ([Indasari et al.,](#)

2023; Mardhatillah & Rahmatina, 2022; Nurasni et al., 2023). This was also evident during the implementation of this research, as students exhibited enthusiasm in learning about the concepts of surface area and volume of a sphere.

The development of the Flip PDF Corporate e-module is highly beneficial for elementary school students as it engages them through various media within the e-module, including visual, audio, and audio-visual elements. This e-module strongly supports the implementation of the "Merdeka Curriculum" in elementary schools (Aziz, 2011; Octaviani & Desyandri, 2023). Therefore, the development of the Flip PDF Corporate e-module is crucial in this era of independent learning. The goal of developing the Flip PDF Corporate e-module is to facilitate students' learning interest and understanding, which will impact their mathematics learning outcomes and learning achievement in elementary schools.

#### 4. CONCLUSION

The results of the analysis and the hypothesis testing and with the error rate of ( $\alpha = 0.05$ ), it can be concluded that: The use of Flip PDF Corporate learning media in mathematics learning plays a significant effect on students' understanding of the concepts of surface area and volume of sphere materials in the sixth-grade students of State Elementary School Sardonoarjo 1. This is based on the results of the Independent Sample T-Test with a p-value or Sig (2-tailed)  $0.024 < \alpha$ . The average post-test value for the experimental group was (84.3) which is higher than the control group (77.7). Therefore, it can be concluded that there is a difference in the value obtained between students' conceptual understanding with the use of Flip PDF Corporate learning media and without using the learning media (conventional). Besides, there Flip PDF Corporate increases students' understanding of the mathematical concept of surface area and volume of the sphere in the sixth-grade students of State elementary school Sardonoarjo 1.

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