



The Effect of Using E-Module Based on Flipbook Maker on Student Understanding of the Starter System

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Abstract

A significant challenge in contemporary education is the limited understanding of technical subjects by students, such as the starter system within the Automotive Engineering program. The use of less engaging learning media leads to a decrease in student motivation, which ultimately affects academic performance. This study investigates the impact of an e-module, designed with Flipbook Maker, on student comprehension of the starter system. A quantitative approach was employed, utilizing pretests and posttests, along with surveys distributed to measure changes in understanding and student responses to digital learning media. The collected data was analyzed using simple linear regression through the SPSS software. The study involved a sample of 70 students from the XI grade of the Automotive Engineering program at SMK Negeri 1 Kandeman. The results revealed that the use of the e-module significantly improved student understanding, with a correlation coefficient (R) of 0.469 and an effect size (R Square) of 0.673, indicating that 67.3% of the variance in understanding was explained by the e-module. In conclusion, the e-module effectively enhanced student comprehension of the starter system. Students expressed a preference for digital learning media due to its flexibility in being accessed anytime and anywhere, both online and offline.

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INTRODUCTION

Vocational education plays a strategic role in preparing human resources that are ready for the workforce, particularly in addressing the challenges of the Fourth Industrial Revolution, which demands mastery of technical skills and digital technology. Vocational High Schools in Indonesia are designed to produce graduates with competencies that align with the needs of the labor market (Suparyati & Habsya, 2024). According to Fadya Safitri Rahman et al. (2024), the primary goal of vocational high school is to equip students with practical skills that can be directly applied in the workforce. The quality of learning in vocational high school is of paramount importance, as vocational education must adapt to meet the ever-evolving needs of industries and society (Hartanto et al., 2019). Therefore, the quality of learning in vocational high school must continuously improve to meet the demands of an evolving industry.

In practice, learning at SMK still faces significant gaps, especially in the competency of the Automotive Engineering program, where there are numerous challenges. One of the common challenges is the limited learning media and the continued reliance on conventional teaching methods (Rahmagandi et al., 2024). Utomo (2020) argues that technical and abstract subject matter, such as the starter system, is often difficult for students to grasp when only presented through lectures or static media like PowerPoint slides. This issue is further exacerbated by the low motivation of students, as observed by the researcher through teaching experiences and interviews with vocational teachers at SMKN 1 Kandeman. Observations revealed that students tended to lose focus during lessons, often using mobile phones for non-learning purposes, and showed low participation in classroom activities.

Interviews with several students also revealed that they struggled to understand the starter system material due to limited learning resources and the lack of interactive teaching methods. They relied solely on notes from teachers, without supporting media that could visualize complex technical processes. As a result, the understanding of the material by students was insufficient, and their academic performance did

not meet the established learning competency standards. This situation emphasizes the necessity of updating teaching methods by integrating more innovative and adaptive educational technologies (Ajiban, 2024).

The integration of Information and Communication Technology into the learning process presents a potential solution to these issues (Rivalina, 2014). In line with the views of Anwar & Murtopo (2024), multimedia, simulations, and e-learning enable students to learn in a more engaging and profound manner, allowing for the visualization of abstract concepts and offering flexibility in the learning process. The use of e-modules as a digital learning medium offers flexibility, accessibility, and interactivity, which can support more effective and independent learning. According to Hendra et al. (2022), incorporating technology into learning tools not only improves the quality of education but also prepares students with relevant skills for an ever-changing workforce. This approach helps students visualize technical concepts in a more contextual and engaging manner, thereby increasing their interest and involvement in the learning process (Khotimah et al., 2025).

One platform that can be used to develop interactive e-modules is Flipbook Maker (Adli, 2020). This platform allows for the conversion of traditional learning materials into dynamic and engaging digital media, complete with visual and audio elements that enhance learning (Syifa et al., 2024). According to Mahendri et al. (2023), Flipbook Maker can increase the appeal of instructional materials by displaying pages like an interactive magazine, featuring navigation tools, links, quizzes, and audiovisual media. With these features, students can become more active in exploring the material, engage in self-directed learning, and improve their understanding of topics, such as the starter system in vehicles.

This study aims to provide a clearer picture of how the use of e-modules based on Flipbook Maker can affect student understanding of the starter system in vocational high school. In the digital era, utilizing technology-based learning media has become essential for enhancing the effectiveness of education, particularly for subjects that are both theoretical and technical,

like the starter system (Khoiriyyah & Arsana, 2018). According to Huda & Widjanarko (2020), e-modules allow students to learn anytime and anywhere, offering content in more engaging formats with multimedia support such as videos, animations, audio, and interactive quizzes. By understanding the extent to which e-modules based on Flipbook Maker can support student learning, teachers can evaluate and develop more interactive and adaptive teaching strategies that align with student needs (Hamdi et al., 2022).

The primary objective of this study is to analyze the impact of using e-modules based on Flipbook Maker on the understanding of students in the Automotive Engineering program of vocational high school, particularly on the topic of the starter system. By exploring the relationship between the use of digital learning media and student competency achievement in a specific topic, this research aims to provide concrete recommendations for teachers and schools to enhance technology-based learning quality, thus creating a more engaging, efficient, and effective learning process that positively impacts student learning outcomes.

METHODOLOGY

This study adopts a quantitative approach with simple linear regression analysis. Data collection techniques include the distribution of pretest and posttest questions, as well as a questionnaire to assess the extent of e-module usage based on Flipbook Maker by students and their understanding of the starter system material. Additionally, observations were conducted to monitor student engagement during the learning process with the e-module, and interviews were used to gather more in-depth information regarding student learning experiences with the media. The research instruments were developed based on indicators representing the variables of e-module usage and understanding of the starter system material, and they were used as guidelines for distributing questionnaires to respondents. The observation instrument was designed to guide the researcher in recording student activities during the lessons. Prior to use, the research instruments underwent validation by experts and were deemed appropriate for use. The research instrument outline can be seen in Table 1.

Table 1. Instrument Outline for E-Module Usage and Student Understanding

No.	Material	Indicator
1.	Function of the Starter System	1. Usage of the starter system in vehicles 2. Role of the starter system in the engine starting process 3. Benefits of the starter system for engine efficiency.
2.	Principles of the Starter System	1. Workflow of the starter system from the power source to motor operation 2. Process of converting electrical energy to mechanical energy 3. Logical and sequential operation of the starter system
3.	Components of the Starter Motor	1. Names of the main components of the starter motor 2. Functions of the starter motor components 3. Location and physical form of the starter motor components
4.	Starter System Inspection	1. Correct procedure for inspecting the starter system 2. Measuring tools for inspecting current and voltage in the starter system 3. Inspection methods for assessing the condition of the starter system

In addition to the outline for understanding the starter system material, this study also developed an outline for the e-module usage variable, consisting of five key indicators that serve as a reference to evaluate the effectiveness of the e-module in supporting the learning

process. The first indicator is ease of use, which evaluates how easily students can access and operate the e-module without technical difficulties. The second indicator is learning, which measures how the e-module helps improve student understanding of the material. The third

indicator is relevance to the material, which assesses how the content of the e-module aligns with the basic competencies and learning objectives of the starter system. The fourth indicator is appeal, which includes visual design, interactivity, and elements that make the e-module more engaging for students. Finally, the fifth indicator is the capability for self-directed learning, which evaluates whether the e-module allows students to study independently without depending on the teacher. These five indicators were used to develop the questionnaire instrument to measure student perceptions of the use of the Flipbook Maker-based e-module.

The data collected from these outlines were then processed using the SPSS software following

a series of prerequisite analysis tests, including (1) normality test, (2) homogeneity test, and (3) linearity test (Sugiyono, 2019). Once all prerequisites were met, data analysis was conducted using simple linear regression to examine the impact of using the Flipbook Maker-based e-module on student understanding of the starter system material. The population for this study consisted of 70 students from the XI grade of the Automotive Engineering program at SMK Negeri 1 Kandeman. The sampling technique employed was total sampling, meaning the sample size is equal to the population size, i.e., 70 students. The model illustrating the impact of e-module usage on student understanding is presented in Figure 1.

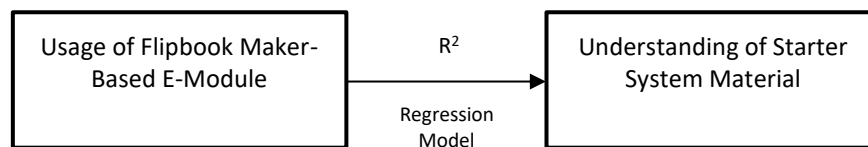


Figure 1. Research Regression Model

RESULT AND DISCUSSION

Research Results

The data obtained from the research were analyzed according to established scientific principles, beginning with prerequisite tests to ensure the suitability of the data for further analysis. The data processing was performed using the SPSS application with multiple linear regression analysis. Before conducting the main analysis, three stages of prerequisite testing were carried out: (1) a normality test using Kolmogorov-Smirnov analysis, which resulted in a significance value of 0.200 (> 0.05), indicating that the data were normally distributed and suitable for parametric analysis; (2) a homogeneity test using Levene's Statistic, which

showed a significance value of 0.153 (> 0.05), indicating that the variances between groups were homogeneous; and (3) a linearity test to assess the linear relationship between the independent and dependent variables, with a Deviation from Linearity significance value of 0.870 (> 0.05) for the variables of awareness and compliance with the implementation, showing that the relationship between variables was linear. After meeting all prerequisite tests, the process continued with multiple linear regression analysis to determine the effect of the independent variables on the dependent variable. The results of this analysis are displayed in Tables 2, 3, and 4, which present the SPSS output used in this study.

Table 2. Multiple Regression Coefficients Output with SPSS

Coefficients ^a						
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
	B	Std. Error	Beta			
1	(Constant)	113.870	12.112	9.402	.000	
	Penggunaan E-Modul	1.353	.153	.469	2.306	.004

a. Dependent Variable: Student Understanding

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Based on the regression analysis output in the coefficients table, the significance value for the e-module usage variable is 0.004. Since this value is smaller than 0.05 ($0.004 < 0.05$), it can be concluded that the use of the e-module significantly affects student understanding of the starter system material. Additionally, the t-value of 2.306 exceeds the t-table value of 1.983, further

supporting the conclusion that, individually, the use of the e-module has a significant contribution to enhancing student understanding. Thus, the e-module usage variable, as the independent variable, is proven to have a significant effect on the dependent variable, which is student understanding of the starter system material.

Table 3. ANOVA Output for Multiple Regression Analysis with SPSS

ANOVA ^a					
Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	285.966	1	285.966	5.317	.004 ^b
Residual	3657.020	68	53.780		
Total	3942.986	69			
a. Dependent Variable: Student Understanding					
b. Predictors: (Constant), E-Module Usage					

Based on the output in the ANOVA table, the regression significance value is 0.004. Since this value is less than the significance threshold of 0.05 ($0.004 < 0.05$), it can be concluded that the e-module usage variable, when considered together, significantly affects student understanding of the starter system material.

Furthermore, the calculated F-value of 5.317 exceeds the F-table value of 3.09, indicating that the regression model is valid and significant. Thus, the use of the e-module as a predictor variable contributes to improving student understanding.

Table 4. Model Summary Output for Multiple Regression Analysis with SPSS

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.769 ^a	.673	.359	7.333
a. Predictors: (Constant), E-Module Usage				

Based on the output in the Model Summary table, the correlation value (R) is 0.769, or 76.9%. This indicates a strong relationship between the e-module usage variable and student understanding. The coefficient of determination (R Square) is 0.673, meaning that 67.3% of student understanding of the starter system is influenced by the use of the e-module. The remaining 32.7% is influenced by other factors not discussed in this study.

Discussion

Based on the results of the linear regression analysis using SPSS, the correlation significance value (R) of 0.769 indicates a strong relationship between the use of the e-module and student understanding. The R Square value, which represents the impact of e-module usage on

student understanding of the starter system material, is 0.673 or 67.3%. This result suggests that the use of the e-module not only has statistical significance but also practically contributes to the improvement of student understanding. During the learning process, students showed higher interest and engagement. They reported finding it easier to understand the material, particularly the starter system, due to the interactive, systematic presentation in the flipbook format, which can be accessed anytime and anywhere. The visual features and intuitive navigation within the e-module enabled students to study the material more deeply and independently, thereby supporting an overall improvement in their conceptual understanding.

The e-module plays a vital role in enhancing student comprehension, particularly

for the starter system material, by integrating various modern learning elements that support more effective understanding. In terms of design and presentation, the e-module is digitally designed with visual elements such as images, interactive icons, graphs, and even videos or animations, which assist students in understanding abstract or technical material. For topics like the starter system, which involves technical terms and mechanical procedures, the visualization within the e-module is invaluable for helping students imagine and understand the processes more clearly compared to just reading conventional textbooks.

The structure of the material in the e-module is more systematic and organized, with each section arranged in a logical sequence that supports students thinking processes. The content is divided into subsections, including learning objectives, concept explanations, practice questions, and feedback discussions, all of which indirectly promote independent learning skills. This structure allows students to learn gradually and focus on one topic before moving on to the next (Prihatiningtyas & Sholihah, 2021). The e-module offers high accessibility. Since it is digital and presented in a flipbook format, it can be accessed across various devices such as laptops, tablets, and smartphones. This flexibility allows students to learn anywhere and anytime, based on their availability and free time. This, of course, contributes to more effective and efficient learning time. With this ease of access, students can also review materials as needed, which is essential for reinforcing memory and comprehension.

The e-module also allows for greater interaction between the material and students. Features such as navigation buttons, quick quizzes, and simulations make learning more interactive, ensuring students are not only passive readers but are actively exploring the material. This active engagement plays a key role in improving information retention and making the learning experience more enjoyable and less monotonous. This approach also encourages the development of independent learning and digital literacy skills. In the learning process with the e-module, students are trained to manage their own time and learning strategies. This is crucial for

fostering a learning attitude that does not solely depend on the teacher but also encourages proactive self-learning.

The findings of this study are supported by field observations conducted during the research process. Based on observations and interviews with several students after using the e-module, it was evident that the use of the Flipbook Maker-based e-module provided a more enjoyable and flexible learning experience. Students found it easier to comprehend the material due to the interactive and engaging nature of the e-module. Several students mentioned that the e-module helped them focus more on studying the material in detail, especially the starter system, which had previously been considered quite complex. This condition aligns with the concept of information and communication technology-based learning, where students are trained to be active, independent, and digitally literate. Observations also showed that students were more enthusiastic and engaged throughout the learning process. This active engagement is a contributing factor in improving student understanding, as reflected in the quantitative data analyzed.

The findings of this study align with Sape et al. (2024), who stated that the use of digital learning media like e-modules can enhance student understanding. E-modules help students understand the material more easily due to their appealing, systematic presentation and the ability for students to learn at their own pace (Mahendri et al., 2023). E-modules also provide students with the freedom to access materials anytime and anywhere, thereby reinforcing the process of independent learning (Wulandari et al., 2023). Therefore, from the discussion and analysis conducted, it can be concluded that the use of Flipbook-based e-modules has a positive and significant impact on student understanding, particularly for the starter system material in the XI grade of the Automotive Engineering program at SMK Negeri 1 Kandeman.

CONCLUSION

Based on the analysis and observations during the research process, it can be concluded that the use of the Flipbook Maker-based e-module significantly impacts student

understanding. The main aspect affected is the improvement in the cognitive understanding of students in the XI grade of the Automotive Engineering program at SMK Negeri 1 Kandeman regarding the starter system material. The interactive and easily accessible e-module, available both online and offline, helps students comprehend technical concepts more deeply, independently, and flexibly. This is reflected in the increase in posttest scores and the positive responses from students in the questionnaire, indicating that this medium effectively supports the learning process of the starter system material.

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