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Effectiveness of Using Flipbook-Based E-Module to Improving the Data Analysis Ability of Beauty Education Students

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ABSTRACT

Data analysis skills are very important and needed in various sectors, both in education and the professional world. However, many students face challenges in mastering fairly complex data analysis techniques. One method that is increasingly popular in assisting the learning process is the use of E-Modules. These E-modules provide opportunities for students to learn in a structured and flexible way, and allow the material to be tailored to their individual needs. This study aims to evaluate the effectiveness of the use of E-Modules in improving students' ability to analyze data. This study uses a quantitative descriptive approach and collects data through pre-test and post-test questionnaires. The data obtained were then analyzed using a t-test for two paired samples (paired t-test). The paired T-test is used to measure significant changes in students' data analysis skills as seen from the comparison of pre-test and post-test scores. The results of the study indicate that the use of flipbook-based E-modules has proven effective in improving students' data analysis skills. This is evidenced by the results of the paired t-test which shows a significance value (2-tailed) of 0.000, which is less than 0.05, indicating a significant change in the pre-test and post-test results. Thus, it can be concluded that the use of flipbook-based E-modules has a significant influence on improving students' data analysis skills.

1. Introduction

The ability to analyze data is one of the skills that is very much needed in various fields, both in education and the world of work. In today's digital age, this skill is becoming increasingly crucial because almost every sector, from business to science, requires data processing and interpretation to make the right decisions. The ability to collect, organize, understand, and interpret data has long been an important skill, not only in engineering, but also in almost all fields of science, technology, engineering and mathematics (Adhiwibowo & Dwi Putri, 2023). Data analysis skills are essential in STEM fields, and metadata plays a role in providing a clear description of the content, format, and context of data. This helps facilitate understanding in conducting data analysis more effectively (Hampton et al.,2017).

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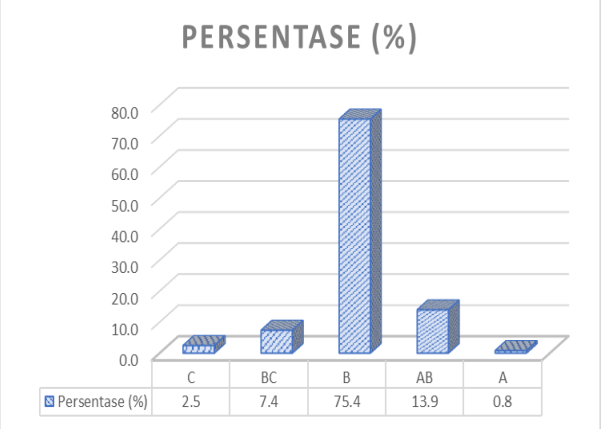
Recently, experts have also emphasized the importance for accounting students to master technology and data analysis skills in order to achieve success. To meet these demands, the AACSB has decided to require all additionally accredited accounting departments to incorporate technology and data analysis skills into their curricula at a minimum [Andiola et al., 2020).

Furthermore, in the world of education, precise calculations are needed in processing research data, starting from the characteristics of the field of education itself to the behavior of students and researchers today (Sitopu et al.,2021). However, many students have difficulty in mastering complex data analysis techniques. The difficulties experienced by students in conducting data analysis can be seen based on the student's statistical values in the following graph.



Description:
C = 60 – 65,
BC = 66 – 70,
B = 71 – 80,
AB = 81 – 85, and
A = 86 – 100

Source:
Statistics Value of Beauty Education Students

Figure 1. Bar Chart of Student Statistics Values

The graph above shows that 2.5% of students got a C, 7.4% got a BC, 75.4% got a B, 13.9% got an AB, and only 0.8% got an A. Furthermore, the average statistical score of students is 76.87, which is not far from the KKM of 75. If observed further, more than 50% of students got statistical scores below the KKM. Meanwhile, the highest score obtained by all students was 86, where out of 122 students only 1 person got a score of 86 while the others got scores below 86. The various descriptions above prove that most students still have difficulty in analyzing data studied in statistics courses. Furthermore, other factors also influence such as lack of understanding of basic concepts, limited practical training, and difficulty in accessing relevant materials can be barriers to the learning process. Therefore, an effective and innovative learning approach is needed to support students in developing these skills.

One of the learning methods that is increasingly developing and gaining widespread attention is the use of E-Modules. This e-module-based learning media provides opportunities for students to learn in a more structured and flexible way, where the material presented can be adjusted to the needs and preferences of each individual. E-Modules themselves consist of various learning tools that include several important components, such as learning materials, evaluation questions, usage instructions, and material summaries. Each element is carefully and systematically designed to support the creation of a more effective and interesting learning process, thus enabling students to achieve the desired competencies optimally (Romayanti et al.,2020).

E-modules in learning allow students to learn at their own pace, while still mastering key concepts in data analysis. Independent learning through these modules can increase students' motivation and understanding because they can learn without time pressure and with easy-to-understand material. The application of e-modules can also have an impact on the implementation of well-organized learning, taking place independently, achieving optimal results, and producing clearly measurable output (Rokhmania & Kustijono, 2017).

Therefore, the purpose of this study is to evaluate the extent to which the effectiveness of the use of e-module media can contribute to improving students' data analysis skills, as well as to identify its influence on understanding and analytical skills needed in an academic context. Effective learning occurs when students acquire skills, knowledge, and enjoyable experiences through a learning process designed to achieve the desired goals (Kumalasari & Eimelda, 2022). One of the main goals of education is to improve the quality of students. Therefore, the achievement of educational goals is highly dependent on various factors that influence it (Kurniawati, 2020). By using a pre-test and post-test approach, this study will evaluate the improvement of students' data analysis skills before and after they use the e-module media. The results of this study are expected to provide insight into how effective this e-module media is in supporting data analysis learning, as well as contributing to the development of more adaptive and innovative learning methods.

2. Methodology

The type of research used in this article is quantitative research with a descriptive approach. Quantitative research is a structured and systematic approach to studying certain phenomena by collecting measurable data, then analyzing it using statistical, mathematical, or computational techniques. This approach is often applied in various disciplines, both in natural sciences and social sciences (Ramadhan, 2021). In more detail, quantitative research can be understood as a method that aims to test existing theories by analyzing the relationship between variables. These variables are measured using research instruments that produce data in the form of numbers, which are then analyzed through statistical procedures to draw valid and accountable conclusions (Creswell & Creswell, 2022).

The subjects of this study were 92 students of Beauty Education, Faculty of Engineering, Semarang State University who were taking statistics courses. This study was conducted from December 2024 to January 2025 at the Faculty of Engineering, Semarang State University. The data collection techniques and instruments used a questionnaire. The questionnaire used consisted of 15 statement items that functioned to measure students' data analysis skills.

The data used comes from primary data and also secondary data. Primary data is obtained from pre-test and post-test results of students related to data analysis skills. While secondary data comes from students' statistical scores. The data obtained were analyzed using the Statistic Package for Social Sciences 23 (SPSS 23) program. Before the paired t-test was carried out with SPSS 23. An assumption test was first carried out, where the data to be tested must meet the normality assumption. Normality tests for all groups can be carried out with the Kolmogorov-Smirnov and Shapiro-Wilk tests. From testing with SPSS 23, the output will be obtained in the form of a Tests of Normality table. From the table, see the sig. value for each independent variable in the Kolmogorov-Smirnov and Shapiro-Wilk columns. If the sig. value obtained from all independent variables is > 0.05, then all groups are normally distributed.

Furthermore, the pre-test and post-test data that have been collected are analyzed using a t-test for two paired samples (paired t-test). The purpose of the post-test is to evaluate the extent of students' abilities based on the learning that has been done (Magdalena et al., 2021). This is to see the effectiveness of the use of e-modules on data analysis skills. The paired T-test is used to see whether or not there is an increase in data analysis skills based on the post-test values obtained (Mutmainnah et al., 2021).

The paired t-test is one of the hypothesis tests included in the parametric test so that it requires the fulfillment of the assumption test of normally distributed data in each group of variables (Abdan, 2023). This test is used to determine whether there is a difference in the average of two paired groups. However, if the data is not normally distributed, the alternative is a non-parametric test such as the Wilcoxon test (Adhiwibowo & Dwi Putri, 2023).

3. Results

As explained previously, the purpose of this study was to identify the effectiveness of using flipbook-based e-modules to improve students' data analysis skills. Data analysis skills are closely related to the completion of students' theses. Because data analysis skills can be used in various fields. However, many students have difficulty in mastering complex data analysis techniques. One of the learning methods that is increasingly in demand is the use of E-Modules. This e-module media provides opportunities for students to learn in a structured and flexible manner, with materials tailored to personal needs.

Next, after the data is collected and analyzed, the researcher will present the findings obtained. The data analysis process in this study used the Statistic Package for Social Sciences 23 (SPSS 23) program, which is in accordance with the characteristics of the data and the problems being studied. The statistics used are paired t-tests. Before conducting a paired t-test, an assumption test is carried out, namely a normality test, where the data in both groups must be normally distributed (Abdan, 2023).

3.1 Normality Test

As shown by the results of data analysis through the normality test, this test is used to assess whether the data in each group or population follows a normal distribution. Data normality can be known if the Sig value is greater than the significance level, which indicates that the data can be considered normal.

Tabel 1. Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pre_Test	.157	92	.000	.947	92	.001
Post_Test	.198	92	.000	.932	92	.000

a. Lilliefors Significance Correction

Based on the table above, the Sig. value for the pre-test value of the use of the data analysis e-module in the Kolmogorov-Smirnova column is 0.000, where the sig. value is <0.05, then H0 is rejected. so the conclusion is that the pre-test data for the use of the data analysis e-module is not normally distributed. Furthermore, for the Sig. value for the post-test of the use of the data analysis e-module in the Kolmogorov-Smirnova column is 0.000, where the sig. value is also <0.05. Then H0 is rejected. so the conclusion is that the post-test data for the use of the e-module is not normally distributed.

Furthermore, for pre-test and post-test data that are not normally distributed, further analysis can be carried out using the Normal Q-Q Plot obtained from the SPSS 23 output. The following is the Normal Q-Q Plot of Pre-Test and Normal Q-Q of Post-Test:

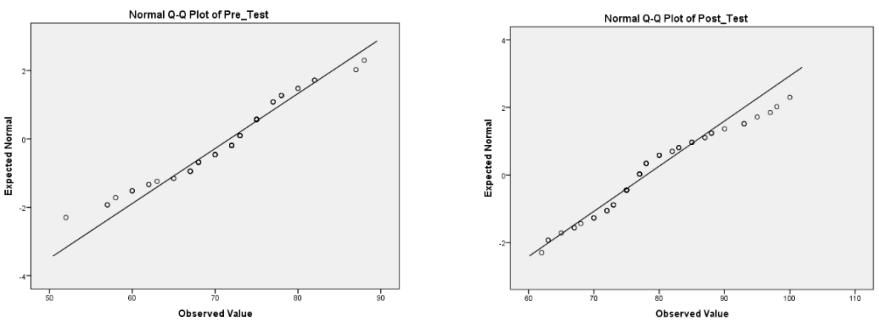


Figure 2. Normal Q-Q Plot of Pre-Test and Normal Q-Q of Post-Test

From the Q-Q plot of both data groups, it can be seen that all data are located around the normal line or close to the normal line. Therefore, it can be concluded that both data groups follow a normal distribution. This is because one of the requirements for data to be considered normally distributed is when the points on the plot are close to or parallel to the normal line.

3.2 Paired sample t test

The paired t test is one type of hypothesis test that is included in the category of parametric tests. Therefore, this test requires the fulfillment of the assumption that the data used in each group of variables must be normally distributed (Abdan 2023). This paired t test aims to test whether there is a significant difference between the averages of two related or paired groups. To explore further, the following presents the results of data analysis obtained using SPSS software version 23.

Tabel 2. Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre_Test	71.7500	92	6.21877	.64835
	Post_Test	78.0435	92	7.47878	.77972

The Paired Samples Statistics table above presents descriptive values for each variable in the paired samples. For the pre-test of the use of the data analysis e-module, the average value (mean) obtained was 71.7500 from 92 data. The distribution of data (Std. Deviation) obtained was 6.21877 with a standard error of 0.64835. While for the post-test of the use of the data analysis e-module, the average value (mean) recorded was 78.0435 from 92 data. The distribution of data (Std. Deviation) found was 7.47878 with a standard error of 0.77972.

From the table presented, it can be observed that there is a difference between the average pre-test and post-test scores, where the post-test score has increased significantly when compared to the pre-test score. However, to ensure whether the difference is truly significant or not, further analysis is needed using the paired sample t-test, which will be explained in detail in the next section. This analysis is important to determine the extent to which the increase has statistical significance.

Tabel 3. Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Pre_Test & Post_Test	92	.731	.000

The Paired Samples Correlations table displays the correlation values that indicate the relationship between the Pre-test results and the Post-test results. From the table, the correlation coefficient is 0.731 with a sig value of 0.000 <0.05. Because the sig value is <0.05, there is a correlation between the Pre-test results and the Post-test results. Further, see the table below.

Tabel 4. Paired Samples Test

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	T	df	Sig. (2-tailed)
Pair 1	Pre_Test - Post_Test	-6.29348	5.15590	.53754	-7.36123	-5.22572	-11.708	91	.000

The Paired Samples Test table is the main table that shows the results of the t-test that has been conducted. In the table, the significance value (2-tailed) is clearly visible, which shows a value of 0.000, which is smaller than 0.05. Because the significance value obtained is smaller than 0.05, this indicates that there is a significant difference between the results of the Pre-test and Post-test. Thus, it can be concluded that the use of the data analysis e-module has a significant impact on improving students' data analysis skills during the learning process, which shows the effectiveness of using this media in supporting the development of students' data analysis skills.

4. Discussion

The implementation of flipbook-based e-modules in learning is one of the innovations that has proven effective in improving students' data analysis competencies and skills. As a learning medium connected to technology, e-modules allow students to learn flexibly and access the information they need anytime and anywhere. In this case, flipbook-based e-modules offer interactive content that supports a deeper understanding of complex concepts, such as statistical data analysis. Flipbook-based e-modules also provide students with the opportunity to learn independently without relying too much on instructors, which greatly supports the achievement of learning objectives.

Based on the data analysis that has been done, it is known that the use of flipbook-based e-modules can improve students' data analysis skills. This is indicated by the average post-test score of students which increased compared to the average pre-test score. In addition, there is a correlation between the average scores of the two groups, namely pre-test and post-test. Furthermore, the increase in students' data analysis skills is also strengthened by the results of the paired t-test between the pre-test and post-test score groups, where the results of the t-test show that there is a significant change between the average score of students before using the e-module and the average score after using the e-module.

The use of interactive learning E-Modules functions as a supporting tool that can help students in the learning process. Where, the E-Modules can be accessed through various devices, such as smartphones or personal computers, so that students can study the material at any time, even outside of class hours (Jafnihirda et al., 2022) (Jafnihirda et al., 2023) (Maulida & Nasrah, 2022). This statement is also in line with the statement (Mutmainnah et al.,2021) which states that the advantage of e-modules is their ability to overcome space and time limitations, so that they can be accessed anytime and anywhere.

Learning technologies such as e-modules play an important role in preparing students for professions that require data analysis skills, such as in accounting and social sciences (Andiola et al., 2020). By utilizing e-modules, students can learn and develop their skills in practical data analysis using a variety of available statistical analysis software and tools. In this case, flipbook-based e-modules provide in-depth tutorials on the use of these tools, so that students can master more complex data analysis techniques, such as regression, hypothesis testing, and multivariate analysis.

Data analysis skills involve various steps, from using command tools to scripting languages such as R or Python to create plots and tables. Ideally, data analysis should be done in a reproducible manner, allowing for technical validation and regeneration of results on original or new data (Mölder et al., 2021). The importance of data analysis skills has been widely described by experts in various fields. So the use of appropriate learning media needs to be considered by lecturers during the implementation of learning.

E-modules are learning resources that make it easier for students to improve their learning outcomes (Nisa et al., 2020). E-modules can be considered effective if they can have a positive impact on student learning outcomes, where there is an increase in learning outcomes between before and after using e-modules (Mutmainnah et al., 2021). This means that the flipbook-based e-module used in this study is effective because it has been proven to have a significant impact on improving students' data analysis skills because.

In addition to being a more interactive learning tool, flipbook-based e-modules also overcome the problem of time and space limitations in the learning process. For example, students do not need to wait for class schedules or instructors to study the material, because e-modules can be accessed online anytime and anywhere. Thus, students can learn at their own pace and repeat material that is considered difficult to understand without feeling rushed or pressured by time (Andiola et al., 2020).

In general, learning using e-modules can be considered as independent learning, where in this case the teacher's role functions as a facilitator who provides direction, support, and guidance, while students have the opportunity to actively develop and deepen their knowledge and skills individually. This process allows students to learn more independently, with teachers acting as guides on their educational journey (Mutmainnah et al., 2021). This supports today's learning, where students or students are required to play an active role in learning or what is known as student center. Learning that uses media to deliver material is more effective than learning that does not utilize media (Arip & Aswat, 2021). Because the use of learning media will make students feel more learning experience.

The use of learning media can improve student learning outcomes, because learning media can involve students creatively in the learning process to develop their thinking skills, which will ultimately improve learning outcomes (Wahyunigtyas et al., 2020). In this context, the use of e-modules as learning media has proven to be very effective in improving students' data analysis skills, both inside and outside the classroom. Students stated that e-modules greatly support the learning process by providing opportunities for independent and flexible learning. In addition, educators also feel helped by the innovation in the form of digital flipbook-based e-modules, which facilitate the delivery of materials and interaction with students (Ramadhina & Pranata). This is in line with the opinion of (Kurniawati, 2020) which states that the existence of e-modules as learning media can increase student motivation in following the learning process.

Further research conducted by (S, stated that the use of flipbook-based e-modules in physics teaching has been proven to improve students' competency achievement, with positive results recorded in static and dynamic electricity materials. Although the study focused more on physics lessons, these findings can be applied in the context of data analysis learning. By adopting similar design principles, flipbook-based e-modules can be applied in various disciplines, including social sciences and economics, to improve students' data analysis skills.

From the discussion above, it can be concluded that the flipbook-based e-module has proven effective in improving students' data analysis skills. This e-module not only offers complete and interactive materials, but also provides opportunities for students to learn independently and flexibly. So that students can gain a deeper understanding of the material and data analysis skills. Therefore, the flipbook-based e-module is a very useful learning tool in higher education, especially in fields that require in-depth data analysis skills.

5. Conclusion and Suggestions

This study aims to examine the effectiveness of using flipbook-based e-modules in improving students' data analysis skills. The data used in this study include primary and secondary data, obtained through questionnaires and grades in statistics courses. Based on the results of the data analysis that has been carried out, including in-depth descriptions and discussions, it is concluded that the use of flipbook-based e-modules has a positive impact on improving students' data analysis skills. This can

be proven through a comparison between the average pre-test and post-test scores of students, which shows an increase in the post-test score compared to the pre-test score. In more detail, the results of the paired t-test show a significance value (2-tailed) of 0.000, which is smaller than 0.05, indicating that the difference between the pre-test and post-test results is very significant. Therefore, it can be concluded that the use of flipbook-based e-modules has a significant effect on improving students' data analysis skills.

As a suggestion, this study suggests that learning in statistics courses can utilize various learning media, including flipbook-based e-modules, to further improve students' data analysis skills. In addition, it is also important to increase the intensity of practice so that students' data analysis skills continue to develop, which in turn will make it easier for them to complete the thesis writing process.

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