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THE RELATIONSHIP BETWEEN THE USE OF ROUTING AND SWITCHING E-MODULES AND STUDENT LEARNING MOTIVATION

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Abstract

This study aims to examine the relationship between the use of e-modules and student learning motivation in the Routing and Switching course in the Informatics Engineering Study Program at Rokania University. The background of this study is the low learning motivation of students due to the dominance of conventional learning methods. The method used is a quantitative approach with data collection techniques through questionnaires distributed before and after the use of e-modules. The instrument was tested for validity and reliability, which showed that all items were valid and had high consistency, with a Cronbach's Alpha value of 0.853. The results of the linearity test showed that the relationship between the two variables was linear, with an F count of 7.443 and a significance of <0.001. The Pearson correlation test showed a coefficient of 0.790, which means there is a strong and positive relationship between the use of e-modules and student learning motivation. These findings indicate that e-modules are able to increase learning motivation through flexible, interactive, and easily accessible presentation of materials. Therefore, e-modules can be used as an effective alternative learning media in increasing student participation and enthusiasm for learning in the digital era.

Keywords: ***e-module, learning motivation, students, Routing and Switching***

INTRODUCTION

Along with the rapid development of technology, it has brought many very significant changes in several fields, such as information, communication, health, entertainment, and also in the world of education. Currently, almost all human activities involve technology, especially in the field of education, therefore, besides human resources, the main factor that determines a country's competitiveness is innovation and mastery of technology, not only students who need to be equipped to develop creativity and innovation, educators are also expected to have higher creativity and innovation in teaching (Rokhmania and Kustijono 2017). Currently, with the development of increasingly innovative learning media with the existence of interactive learning based on information technology. Diverse learning strategies and media are needed by educators, especially lecturers in carrying out learning activities to foster interest, encourage learning outcomes, enthusiasm, and develop student creativity. E-modules are designed to facilitate students in understanding the material independently without having to always rely on the presence of lecturers.

These e-modules are presented in digital formats of various media forms such as video, audio, and animation to clarify more complex processes, so that with the existence of e-modules, students can learn more flexibly according to the curriculum and their learning needs and allow lecturers to control the content that students learn will be more effective because it is compiled by the lecturer himself so that it can be adjusted to the planned curriculum (Rina Amelia Safitri, Pahriah, and Putrayadi 2022). The role of e-modules is as teaching materials designed by lecturers as the main material, and introduced to students so that they have the knowledge and experience to apply it in learning, while students learn independently using the e-modules, where the role of the lecturer is more to help students who have difficulty in understanding the material that has been designed (Wahyuni and Rifmasari, nd). At this stage, e-module-based teaching materials where students are taught to understand and explain what is contained in the e-module material, therefore e-modules are expected to increase students' interest in learning which is more interesting and interactive. Interactive e-modules as a distance learning medium have been proven effective in improving student learning outcomes and independence, where teachers provide instructions to students on how

to access and use e-modules so that it makes it easier for students to understand the material, and not get bored because it is in the form of text, images, and audio (Wulandari, Adnyana, and Santiasa 2020). According to Nasih et al., (2019), the use of e-modules occurs when students receive stimuli that involve their experiences during the learning process. When students observe and try e-modules and then connect them with previous learning experiences, the use of e-modules on student learning outcomes greatly influences their interest and motivation to learn. In the context of learning, routing and switching e-modules allow students to access material flexibly anytime and anywhere, thus supporting efficient learning. Each student has a different opinion depending on what they observe or experience during the learning process. In a school there must be rules and regulations, students who have a high level of discipline will get good learning outcomes, so that there is a close relationship between learning discipline and learning motivation, to foster student discipline, the role of teachers is needed to guide their students. Each student has different characteristics and learning styles, as teachers must have a good understanding in using multimedia technology and must be adjusted to the individual needs of students, so that there are results of the relationship between learning styles in using multimedia and student learning motivation (Wahyudi et al. 2023).

At Rokania University, the routing and switching course is one of the core courses in the field of computer networks that aims to equip students with knowledge and skills about computer network management, including the configuration of routing and switching network devices, which includes an understanding of network protocols, data traffic management, and network troubleshooting. Based on researchers' observations at Rokania University, this university has adopted various technological innovations in the learning process, the use of e-modules as one of the main learning media. However, the implementation of e-modules at Rokania still has an impact on the process and motivation of student learning. The lack of maximum use of e-modules by lecturers and students causes a lack of learning alternatives, even though e-modules are designed to help students learn independently that can be accessed anywhere and anytime. Students' difficulties in understanding the course are also influenced by the lack of integration and practice. When students only receive explanations without the support of simulations or direct practice, the learning process becomes less meaningful. Thus, researchers took the initiative to examine the relationship between the use of e-modules and direct practice in the use of e-modules, this study aims to reveal the extent to which the relationship between the use of e-modules accompanied by practice can affect student learning motivation. So in this case, e-modules can function as learning media that support students' independent learning which is well designed to understand the material according to their learning speed, so it is hoped that it can increase learning motivation. Based on this background, the author conducted research with the title "The Relationship between the Use of E-Modules in Routing and Switching Courses and Student Learning Motivation."

LITERATURE REVIEW

This research uses quantitative research. The research method is a scientific way to obtain data that is in accordance with certain objectives, quantitative research is used to measure data in numerical form and analyze it systematically and objectively. Quantitative research is a scientific method based on concrete, systematic, measurable, and objective principles, with a focus on analyzing data in the form of numbers processed using statistics. This research aims to examine certain populations and samples, usually with random sampling techniques, research instruments are used to collect data to be analyzed statistically, with the main goal of testing previously formulated hypotheses. This research uses a quantitative method with a correlation approach. This research was conducted at Rokania University, located in Langkitin, Rambah Samo District, Rokan Hulu Regency, Riau. The research took place during the even semester of the 2025/2026 academic year, starting in December 2025.

The population in this study was all sixth-semester students taking the Routing and Switching course, consisting of Class VI A and also serving as a sample in this study, totaling 22 students. To ensure this study produces valid data and is in accordance with field conditions, this study used data collection techniques such as observation, interviews, and documentation. The instrument for this study was carried out by distributing questionnaires to predetermined respondents. Before being used in the main study, the questionnaire instrument was tested for validity to ensure that each question was able to measure the intended variable. In addition, a reliability test was conducted to assess the consistency and reliability of the research instrument. Next, the collected data were analyzed using a correlation test to determine the relationship between the variables studied (Jabnabillah and Margina 2022). The following is an explanation of each test and formula used for the research instrument using quantitative techniques, including validity, reliability, and correlation tests, which focused on measuring understanding related to student learning motivation and the relationship between the use of e-modules in the routing and switching course. This type of research can be classified as a correlation test.

Data collection techniques or research instruments are one of the tools used to find answers. This study aims to analyze the extent of the relationship between variables X and Y, using statistical testing involving three main components: validity, reliability, and correlation. These three analyses play an important role, as explained below:

1. Validity testing is used to ensure that a research instrument is truly capable of measuring what it is supposed to. Higher instrument validity indicates more accurate measurement of the data. Validity testing is essential to ensure that the questions posed do not produce data that deviates from the intended description of the variable. In theory, validity can be measured using the product-moment correlation as follows:

$$rxy = \frac{n\sum_{j}^{n} = 1xijyj - \left(\sum_{j}^{n} = 1xij\right)\left(\sum_{j}^{n} = 1yij\right)}{\sqrt{n\sum_{j}^{n} = 1x_{ij}^{2} - \left(\sum_{j}^{n} = 1\,x_{ij}\right)^{2}}\sqrt{n\sum_{j}^{n} = 1y_{ij}^{2} - \left(\sum_{j}^{n} = 1y_{ij}\right)2}}$$

Source (Amanda, Yanuar, and Devianto 2019)

Information:
n = number of observations/respondents
x = total score obtained from all items of variable x
y = total score obtained from all items of variable y

2. A reliability test is an index test that indicates the extent to which a measuring instrument can be trusted and relied upon. It indicates the extent to which measurement results remain consistent when repeated on the same phenomenon twice or more using the same measuring instrument. A measuring instrument is said to be reliable if it produces the same results even when measured repeatedly. A questionnaire is considered reliable if the answers are consistent, stable over time, and have high reliability. Reliability calculations can be performed if the variables in the questionnaire are valid. Therefore, validity must be calculated before reliability. If the questions in the questionnaire are invalid, there is no need to continue with reliability testing. Reliability testing can be measured using the Cronbach's Alpha (a) formula as follows:

$$a^2 = x = \frac{\sum x^{2\,-[(\frac{\sum x^2}{n})]}}{n}$$

Source:(Utami, Muslim Rasmanna, and Khairunisa 2023).

Information:
K = number of questions
$\sum\sigma^{2}$= total questions
$\sigma_t 2$= total variance
N = number of respondents

3. Correlation test: used to measure the extent of the relationship between two variables being studied. In this study, the correlation test used is the person correlation to examine the relationship between interval variables. This formula is used to calculate the correlation coefficient between two variables with interval-scale data to determine the direction and strength of the relationship between them. The formula is:

$$rxy = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

Source:(Jabnabillah and Margina 2022).

Information :
r is the Pearson correlation coefficient
x and y are two variables whose relationship is being tested
n is the number of samples
∑xy is the sum of the results of multiplying the values of variables x and y
∑x2 and ∑y2 are the sum of the squares of the values of x and y.

If the calculation results show that the r value is greater than the r table value at a certain significance level (usually 0.05), then it can be concluded that there is a significant relationship between the two variables.

RESULTS AND DISCUSSION

RESULTS

The results of this study include three main types of analysis, namely validity tests, reliability tests, and Pearson correlation tests on the questionnaire instrument used to measure the relationship between the use of e-modules in the Routing and Switching course and students' learning motivation. In the data collection process, researchers distributed questionnaires to students twice, before and after the implementation of the e-learning module. The purpose of distributing these questionnaires was to identify changes in students' learning motivation levels after using the e-module as a learning medium. The number of respondents in this study was 22 students from the same study program. The following presents the identity data of the respondents who participated in this study.

Table 1. Identity of Student Respondents

No	Student Name	Nim	Gender
1	R	2204010	Woman
2	NBI	2204016	Woman
3	PS	2204022	Woman
4	A	2204036	Woman
5	NOW	2204029	Man
6	RPS	2204019	Man
7	FJH	2204027	Man
8	JA	2204028	Woman
9	KA	2204031	Man
10	RP	2204004	Woman
11	J	2204012	Woman
12	NA	2204011	Woman
13	CM	2204008	Woman
14	MDS	2204005	Man
15	RRFL	2204003	Man
16	S	2204035	Woman
17	NU	2204013	Woman
18	FAN	2204001	Man
19	FAA	2204017	Man
20	AHA	2204020	Man
21	Z	2204037	Man
22	SH	2204038	Man

1. Validity Test

To determine the extent to which each item in the instrument accurately represents the construct of e-module use, a validity test was conducted using Pearson correlation. This test aims to ensure that each item in the questionnaire significantly contributes to the measured variable.

Table 2. Results of Instrument Validity Test

Variable X				Variable Y			
Statement	**r-count**	**r-table**	**category**	**Statement**	**r-count**	**r-table**	**Category**
P1	0.648	0.423	Valid	P1	0.537	0.423	Valid
P2	0.834	0.423	Valid	P2	0.581	0.423	Valid
P3	0.751	0.423	Valid	P3	0.481	0.423	Valid
P4	0.606	0.423	Valid	P4	0.662	0.423	Valid
P5	0.626	0.423	Valid	P5	0.494	0.423	Valid
P6	0.514	0.423	Valid	P6	0.581	0.423	Valid
P7	0.554	0.423	Valid	P7	0.464	0.423	Valid
P8	0.454	0.423	Valid	P8	0.515	0.423	Valid
P9	0.537	0.423	Valid	P9	0.549	0.423	Valid
P10	0.476	0.423	Valid	P10	0.538	0.423	Valid

Based on Table 2, all items in variable X show a positive and significant Pearson correlation value with the total score, with the highest value reaching r = 0.834 and significant at p < 0.01. This indicates that all items are valid in measuring the level of e-module use by students. Items such as p2, p3, and p10 show a strong contribution to the overall construct, which strengthens the belief that the questionnaire has been well designed to measure this variable. The next step was to test the validity of the instrument for variable Y, namely student learning motivation. This test was conducted to ensure that each item in the questionnaire truly reflects the overall dimensions of learning motivation. It was seen that most items had a significant correlation with the total learning motivation score, such as p4 (r = 0.662; p < 0.01) and p10 (r = 0.538; p < 0.01). Although some items such as p1 and p5 showed a lower correlation, the overall significance value still met the validity requirements, with the highest coefficient reaching 0.662. Thus, it can be concluded that these items are valid in measuring students' motivational aspects of the e-module-based learning process.

2. Instrument Reliability Test

After all questionnaire items were declared valid, the next step was to ensure that the instrument produced consistent results when applied repeatedly. Therefore, a reliability test was conducted using the Cronbach's Alpha formula.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.853	.883	2

Figure 1. Reliability Statistics of Research Instruments (Variables X and Y)

Based on the reliability test results shown in Figure 1, a Cronbach's Alpha value of 0.853 was obtained, indicating a very high level of internal consistency. This value exceeds the minimum standard of 0.70, indicating that the instrument is classified as highly reliable. Even after standardization, the alpha value increased to 0.883, confirming that the questions used to measure e-module usage and learning motivation have strong inter-item alignment. Before reliability is analyzed, it is important to ensure that all data used in the test is complete and that none is wasted due to missing values.

Case Processing Summary

		N	%
Cases	Valid	22	100.0
	Excluded[a]	0	.0
	Total	22	100.0

Figure 2. Data Processing Summary

The recapitulation results showed that all data from the 22 respondents was 100% valid, with no cases excluded (see Figure 2). This strengthens the reliability of the reliability test results, as there was no missing data that could affect the analysis. In the Inter-Item Correlation Matrix, the correlation between two variables (X and Y) shows a value of 0.790, which is considered high. This means that the two variables have a strong internal relationship in measuring a composite construct.

Inter-Item Correlation Matrix

	X	Y
X	1.000	.790
Y	.790	1.000

Figure 3. Correlation Between Instrument Items

To determine the contribution of each item to the total reliability of the instrument, an item-total analysis was conducted to identify whether the deletion of certain items would affect the stability of the instrument.

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
X	47.5455	5.688	.790	.624	.
Y	45.7727	11.422	.790	.624	.

Figure 4. Item-Total Statistics for Reliability Test of Variables X and Y

Figure 4 shows that both variables X and Y have an item-total correlation value of 0.790, indicating that both items consistently contribute to the composite construct. If one of the items is removed, the Cronbach's Alpha value actually decreases to 0.624, thus concluding that no items need to be eliminated because all of them support the overall consistency of the instrument.

3. Pearson Correlation Test

After it was discovered that the relationship between e-module use and learning motivation was linear, the next step was to test the strength and direction of the relationship between the two variables using Pearson correlation analysis. This test was used to statistically determine the extent to which e-module use was associated with increased student learning motivation.

Correlations

		X	Y
X	Pearson Correlation	1	.790**
	Sig. (2-tailed)		<.001
	N	22	22
Y	Pearson Correlation	.790**	1
	Sig. (2-tailed)	<.001	
	N	22	22

Figure 5. Pearson Correlation between E-Module Use (X) and Student Learning Motivation (Y)

The results of the Pearson correlation test in Figure 5 show that the correlation coefficient value between variables X (e-module usage) and Y (learning motivation) is 0.790 with a significance value of $p < 0.001$. This indicates that there is a strong and significant positive relationship between the two. This means that the higher the level of e-module usage in the learning process, the higher the student's learning motivation. This finding is in line with the results of previous tests which showed a strong linear relationship, and strengthens the conclusion that e-modules make a real contribution in encouraging students' enthusiasm for active and independent learning.

DISCUSSION

Based on the results of research conducted on students in the Routing and Switching course, it was found that the instrument used in data collection met the requirements of validity and reliability. All items in the questionnaire showed significant correlation values, both on the variables of e-module usage and learning motivation. This indicates that each statement is able to accurately measure the intended construct. Furthermore, the level of consistency of the instrument is also very good, indicated by a Cronbach's Alpha value of 0.853, which means that the questionnaire is able to produce stable and reliable data in the context of social measurement. The correlation between the two variables also supports this conclusion. The Pearson correlation test showed a strong and positive relationship, with a correlation coefficient of 0.790 and a significance value <0.001. This means that the higher the student engagement in using the e-module, the higher their motivation to learn. Interactively designed e-modules not

only facilitate access to the material but also increase student engagement and engagement. This demonstrates that well-designed digital media can replace conventional approaches that have been less effective in optimally encouraging learning motivation. Overall, the results of this study confirm that e-modules can be an effective learning solution for increasing student motivation. By presenting flexible, ubiquitous materials, and designing them in an engaging and interactive manner, e-modules can foster a more independent and meaningful learning experience.

CONCLUSION

This study proves that the use of e-modules in the learning process of the routing and switching course provides a better relationship with student learning motivation. By implementing e-modules as a learning medium, students showed a clear increase in their learning motivation after participating in the course. In addition, the instruments used in this study were proven valid and reliable so that the data obtained can be trusted to describe the actual conditions. The relationship between conditions before and after the use of e-modules showed a strong linear pattern, indicating that e-modules not only helped improve material understanding but also consistently encouraged student learning interest. Overall, the results of this study emphasize the importance of utilizing learning technologies such as e-modules to support the teaching and learning process, especially in courses that require an understanding of technical concepts such as routing and switching. This is evident from the results of the validity test which showed that all items in the questionnaire had a significant correlation with the total score, both in the variables of e-module use and learning motivation.

Thus, the instrument used has been proven valid in accurately measuring both constructs. In addition to validity, the research instrument was also proven reliable. The results of the reliability test using Cronbach's Alpha showed a value of 0.853, indicating a very high level of internal consistency. This means that the questionnaire used was able to produce stable and reliable data, both in measuring e-module usage and student learning motivation as a whole.These results indicate that the more intensively students use e-modules, the higher their motivation to attend lectures. Furthermore, the Pearson correlation test shows a strong and significant relationship between the two variables, with a coefficient value of 0.790 and $p < 0.001$. This strengthens the finding that e-modules are not only a learning complement, but also able to increase student interest, engagement, and enthusiasm for learning. Therefore, e-modules need to be continuously developed and integrated strategically into the learning system, especially in technical courses such as routing and switching to make learning more effective, independent, and meaningful.

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