Use of Interactive Learning Modules to Improve Student Learning Achievement and Self-Regulated Learning

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Abstract. Interactive learning modules are modules developed as multimedia that combine two or more media types, including text, audio, images, animations, and videos which are designed to help students independently achieve their learning goals. This study aims to determine the difference in improving learning achievements and self-regulated learning after the application of interactive learning modules. This study employed a quasi-experimental approach with a pretest-posttest control group design, and the participants comprised all students in the eleventh-grade Science class. The participants in this study consisted of students from the eleventh-grade Science 1 class as the experimental group and those from the eleventh-grade Science 2 class as the control group. Data collection techniques of learning achievement through pretest and posttest, while self-regulated learning through Likert scale questionnaires. The results of the t-test analysis reveal a statistically significant difference in student achievement between the experimental and control groups. Additionally, the level of self-regulated learning in the experimental group is deemed satisfactory, while in the control group, it is considered adequate.

Keywords: Learning Achievement, Self-Regulated Learning, Interactive Learning Modules

1 Introduce

1.1 A Subsection Sample

Learning is an effort made deliberately and systematically by educators to regulate a learning environment that can optimize student learning activities. The learning process is the most important activity in the educational process [1]. The learning process in schools sometimes has not been able to improve the activity of students, because many teachers still present material in a conservative and monotonous manner, resulting in a teacher-centered learning process, where students primarily sit and listen to the teacher. This activity can make learning uninteresting and tedious for students [2].

According to the findings derived from interviews conducted with teachers at MAN 3 Banda Aceh, it has been observed that the human excretory system poses a considerable challenge for students in terms of comprehension. The complexity of the excretory system necessitates understanding intricate processes and acquiring

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Latin terminology, which may be unfamiliar to students. The comprehension of this material may prove challenging if it is solely conveyed through conventional means. The utilization of teaching materials in MAN 3 Banda Aceh remains restricted, primarily consisting of textbooks as instructional resources.

The inadequacy of teaching materials contributes to a less efficient learning process, impacting students' enthusiasm for engagement. This is evidenced by the presence of students who have not met the minimum completeness criteria (KKM). Despite the school's KKM being set at 80, the achievement rate for students in the human excretory system material only reached 35%, with 65% of students falling short of the minimum completeness criteria (KKM).

One of the supporting factors in the learning process is teaching materials, often referred as subject matter. Teaching materials are the most important part of the learning process as it becomes the core of leaning activities [3]. Teaching materials are an arrangement of materials collected and derived from various learning resources that are made systematically. These materials come in various forms, such as printed materials, audio, audiovisual, and interactive teaching materials [4].

Teaching materials that can be used to address these challenges are interactive learning modules. These modules contain a combination of several media, in the form of text, images, animation and video. They are developed using advances in communication and information technology, utilizing the internet. The use of interactive modules is expected to improve the enthusiasm of student in the learning process, ultimately improving learning achievement and self regulated learning [5].

2 Method

The study employed a quasi-experimental approach with a pretest-posttest control group design. The study population comprised all 102 students in the eleventh-grade Science class at MAN 3 Banda Aceh. The research sample, consisting of 68 students from classes XI Science 1 and XI Science 3, was selected using purposive sampling. The research instrument utilized in this study was a test containing 30 multiple-choice questions with 5 answer choices, and self regulated learning questionnaires used containing 26 statements with 5 answer choices [6].

Data for learning achievement were collected by giving tests consisting of pretest and posttest, while to see self regulated learning was collected by distributing questionnaires to students. The method of assessing learning outcomes involves the application of N-Gain, normality test, homogeneity test, and hypothesis testing (t-test). The examination of self-regulated learning is conducted through the analysis of percentage scores.

3 Results and Discission

Derived from the classroom learning process, the mean scores for the academic performance of students in both the experimental and control groups are depicted in the form of a bar chart, as illustrated in Figure 1.

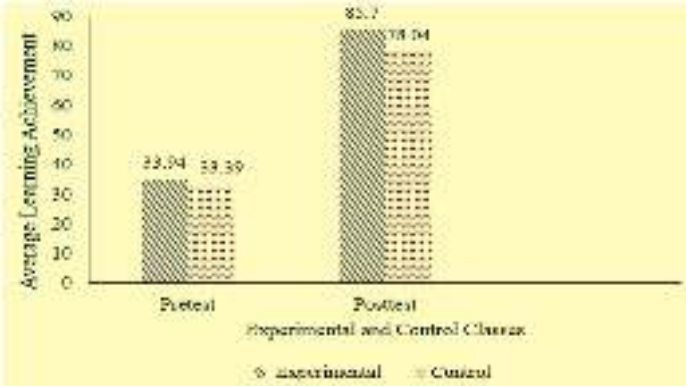

Fig. 1. Average learning achievement

According to Figure 1, it is evident that the average pretest scores in both classes are quite similar, with the experimental class at 34.94 and the control class at 33.93. Subsequently, there is a notable increase in the average learning achievement scores after the completion of the learning process, with the experimental class achieving 85.7 and the control class reaching 78.04 in the posttest scores. To examine the differences in enhancing student learning outcomes through interactive learning modules, the data from the initial ability test, final ability test, and N-Gain analysis are detailed in Table 1.

Table 1. Results of student pretest data analysis.

Class	Average	Normality Test	Homogeneity Test	t- Test
Eksperimental (XI IPA 1)	34.94	Normal Distribution x^2 calculate = 8.0077 x^2 table= 11.07	Homogen f calculate = 1.74 f table =1.79	Not Significant t-calculate = 0.89 t-table =2.00
Control (XI IPA 3)	33.39	Normal Distribution x^2 calculate = 7.8077 X^2 table= 11.07		

As indicated in Table 1, there is a minimal distinction in the average pretest scores between students in the experimental and control classes. Data analysis reveals that the data is both normally distributed and homogeneous. The independent sample t-test

conducted on the pretest scores of the experimental and control classes yields a calculated t-value of 0.89, which is less than the tabulated t-value of 2.00. This implies that there is no significant difference in the pretest results between students in the experimental and control classes, as depicted in Table 2.

Table 2. Results of student posttest data analysis

Class	Average	Normality Test	Homogeneity Test	t- Test
Eksperimental (XI IPA 1)	85.7	Normal Distribution x^2 calculate = 6.4346 x^2 table= 11.07	Homogen f calculate = 1.51 f table =1.79	Significant t-calculate = 5.39 t-table =2.00
Control (XI IPA 3)	78.04	Normal Distribution x^2 calculate = 9.1161 X^2 table= 11.07		

According to Table 2, it is evident that the average posttest score for the experimental class is 85.7, whereas the control class posttest score is 78.04. Data analysis indicates that both sets of data exhibit normal distribution and homogeneity. The results of the independent sample t-test analysis on the posttest scores of the experimental and control classes yield a calculated t-value of 5.39, exceeding the tabulated t-value of 2.00. This indicates that there is a significant difference in learning achievement between the experimental and control classes, as detailed in Table 3.

Table 3. Results of n-gain data analysis of students

Class	Average	Normality Test	Homogeneity Test	t- Test
Eksperimental (XI IPA 1)	0.8	Normal Distribution x^2 calculate = 4.61 x^2 table= 11.07	Homogen f calculate = 1.63 f table =1.79	Significant t-calculate = 5.11 t-table =2.00
Control (XI IPA 3)	0.6	Normal Distribution x^2 calculate = 5.40 X^2 table= 11.07		

According to the information provided in Table 3, it is evident that the mean N-Gain value for students in the experimental class is 0.8, falling into the high category, while for the control class, it is 0.6, categorized as medium. The data analysis results reveal that both sets of data exhibit normal distribution and homogeneity.The outcomes of the

independent sample t-test analysis for the N-Gain values between the experimental and control classes obtained $t_{calculated} = 5.11$ while $t_{table} = 2.00$. This shows that $t_{calculated} > t_{table}$ which means that there is notable disparity exists in the enhancement of learning achievement between the experimental and control classes.

Based on the previous results, it can be seen that the module is a media that can answer the problems being faced, because it has many advantages, which are packaged more attractively and help students evaluate the abilities that have been previously learned. This makes students more independent in carrying out learning through instructions designed in the module, meaning that students can carry out learning activities without the direct presence of a facilitator. Digital module packaging makes the module display more effective, flexible, and easier to use [7].

The learning process in the control class only uses textbooks. Textbooks are difficult for students to understand, because the language is difficult to understand and uninteresting. This causes the level of student reading interest is less, so that the learning achievement of student are low [8]. Then students only hear the explanation of the material from the teacher. Therefore, activities in the control class tend to be less active and less enthusiastic in learning activities. Students only become listeners in the learning process. This causes boredom during the learning process and students find it difficult to understand the material explained by the teacher.

The advancement of technology has become an inseparable aspect across various domains, and one such domain is education. In the current era, education has also evolved with the changing times. The influence of technology on education is evident in the development of instructional materials, which have transitioned from print to digital format. The Interactive Learning Module utilized in this study was designed using the Canva and Book Creator applications.

When implementing interactive learning modules students are very enthusiastic in studying interactive modules through their respective mobile phones. After the students understand the learning module, students work on interactive LKPD about the human excretory system. The material of human excretory system is very abstract when presented by the lecture method alone therefore, interactive learning modules can connect and strengthen the theory with images, animations and videos the processes for involved in the excretory system so as to increase students learning enthusiasm.

Data on students self-regulated learning is measured using a questionnaire consisting of 26 statements with 5 answer options, and the determination of scores using a Likert scale. The percentage of self-regulated learning of the experimental class is presented in Figure 2 below.

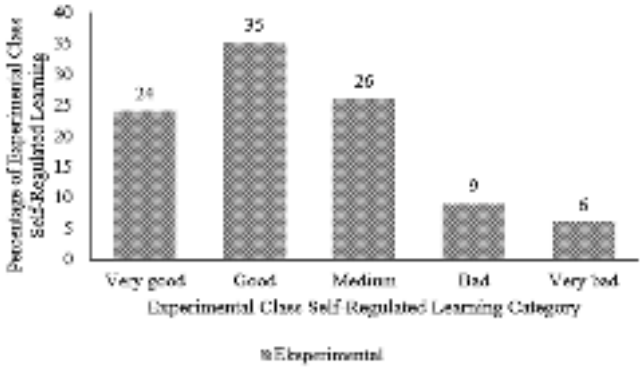

Fig. 2. Percentage of self-regulated learning of experimental class

Figure 2 shows that experimental class students got a very good category 24% (8 students), got a good category 35% (12 students), got a sufficient category 26% (9 students), got a category less 9% (3 students), got a very less category 6% (2 students) as presented at fig 3.

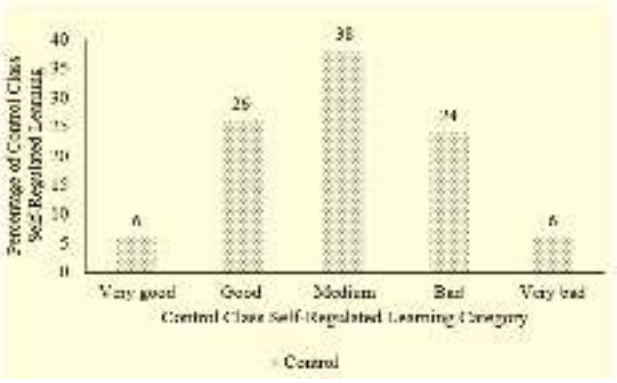

Fig. 3. Percentage of self-regulated learning control class

Figure 3 shows that the control class students got a very good category 6% (2 students), got a good category 26% (9 students), got a sufficient category 38% (13 students), got a category less 24% (8 students), got a very less category 6% (2 students).

The students self-regulated learning in experimental class is categorized as good, because students independently study learning materials through interactive learning modules that have been provided. The presentation of material in interactive learning modules is able to stimulate the learning process of students to be easier [9]. While in the control class student self-regulated learning is in the moderate category, since the

learning process using the lecture method relies primarily on the teacher playing an active role during the learning process.

Self-regulated learning consists of 10 indicators, the first is assignment management. In this indicator what is seen is assignment management depends on one's own ability to plan, perform tasks and get better scores. So that references for assignment work do not only use package books, but also use interactive modules and learning videos, video is one type of audio-visual media that is able to display images and sound at the same time [10]. The second is learning skills, refers to ability to learn from the learning process. The third is stress management, the ability to handle stress. The fourth is technical expertise, the ability in the digital field, with the existence of technology can facilitate the learning process. Students can access information on learning materials from anywhere and anytime [11].

The fifth is delay management, the ability to manage delays in learning. The sixth is discussion skills, the ability to discuss well. The seventh is learning proficiency in class, the ability to learn from teachers and friends and be able to reflect on what has been learned in class. The eighth is competency understanding, the ability to understand a reading and make study notes. The ninth is exam management, the ability to plan do well in exams. The tenth is time management, being able to utilize study time effectively.

4 Conclusion

Drawing from the study's findings, it can be inferred that a substantial divergence exists in the advancement of student learning outcomes following the implementation of the interactive learning module. The assessment of self-regulated learning in the experimental class is characterized as satisfactory, while the control group's self-regulated learning is deemed to be at an adequate level.

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