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The effect of the use of Differentiated Instruction-Based Module on students' learning motivation

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Abstract

The use of modules as teaching materials in the learning process is very important in order to improve the learning outcomes. The differentiated instruction based module is a learning module that differentiates instruction based on the differences of students ability level. Thereupon, the objectives of this study were: (1) to find out the differences of students' mathematics learning motivation before and after the use of differentiated instruction-based module, (2) to determine the effect of using differentiated instruction-based learning module on students' mathematics learning motivation. This study used a quantitative approach and mathematics learning motivation questionnaire as the technique of collecting data. Also, to analyze the data this study used the T-Test (paired Samples T-Test) with the prerequisite of analysis, namely the normality and homogeneity test. Eventually, the results of analysis prerequisite analysis showed that both data were normally distributed and homogeneous. Meanwhile, the results of the t-test showed that there were significant differences between students' mathematics learning motivation before and after the use of the differentiated instruction based learning module.

1. Introduction

Education is the key of a nation progress. It becomes the media of forming human character that obviously will give a very large contribution in the progress of a nation. Thus, the role of educators also greatly determines the quality of education either teachers or lecturers. They have roles as planners, assessors, and implementers in the learning process. A learning should accommodate the interests of all students so that they are able to provide their best performance in learning (Ditasona, 2017). Even more, a learning should contain the meaning of an activity to have and develop a method, strategy, technique or approach in case to achieve the expected learning outcomes (Suparwadi & Parma, 2015).

Learning is an effort to develop students' entire personality, both physically and psychologically. It is conducted to develop all aspects of intelligence, as the results they will be the human beings who are intact, intelligent both emotional and psychomotor and have life skill which is very meaningful to themselves (Suyono & Hariyanto, 2012). In other words, students must be able to develop all the potential that exists within themselves, especially during the learning process.

In order to achieve a positive learning process, teaching material (book/ module/ dictate) becomes highly important yet also complex component. Teaching material used must be able to facilitate students in learning, so they are able to develop all their potential to achieve the learning goals. Unfortunately, teaching materials that have been widely distributed have not been able to facilitate students in the learning process. It goes without saying that students with various characteristics also have different learning interests, abilities, and motivations. Nevertheless, it is undeniable fact that the current teaching materials are still oriented to material and questions which lead to cognitive abilities only and ignore the affective and psychomotor aspect.

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The differentiated instruction based learning module is arranged based on differences in the level of student learning abilities. Differentiated instruction (DI) is learning that pays attention to individual differences in students (Iskandar, 2016). In DI learning, each student gets learning which suits to their needs (Arviana & Siswono, 2014). Concerning to the explanation, DI is claimed as an approach that can make individual difference as a basis of learning planning (Yuliana, 2017).

The modules which are designed to be attractive, easy to learn, and able to answer the needs will lead to students learning motivation (Harta & Lasmiyati, 2014). Modules as the individual learning involve the characteristics of students (Irwan, 2014). By using differentiated instruction based learning modules, students will gain learning experiences that can help them, especially low abilities students in order to be able to have good reasoning ability as for the depth of material they receive according to their level of ability.

According to Dixon et al. (2014), differentiated learning is a complex process in which students work on different tasks but with the same main concepts. With the existence of differentiated instruction based modules, it is expected that students are able to get learning experiences according to their ability level. Therefore, the use of this module will be able to improve student mathematics learning outcomes.

Additionally, mathematics learning outcomes are influenced by several factors. One of the factors is the students' motivation to prepare themselves to begin a learning process. Motivation is a basic impulse that moves a person to act to achieve the expected goal (Masni, 2015). The low motivation of students in conducting learning activities will affect their learning outcomes.

Further, motivation itself is an effort made by someone to achieve his goals. Motivation and learning are two things which reciprocally influence. According to Masni (2015), students' learning motivation is the overall driving force which leads to directed learning activities so the learning objectives can be achieved. Again, students' learning motivation is a condition which encourages and directs their behavior towards the goals to be achieved (Anggraini, 2011). Thus, to achieve the learning objectives, students are encouraged to master learning materials well.

A learning motivation has a distinctive role in fostering passion, happiness and passion for students to learn. It is a factor that can encourage students to move forward and be enthusiastic in learning so that they are able to achieve learning goals. Further, learning motivation indicators can be classified as follows: (1) the existence of desires to be success, (2) the existence of encouragement and needs in learning, (3) the existence of interesting activities in learning, (4) the existence of a conducive learning environment, and (5) the existence of the real effort to achieve the goals.

Based on the facts, it can be concluded that generally, the focus of students problem in calculus learning is the lack of a positive response toward calculus learning, thereby reducing students motivation in learning activities. The fact that occurs in the calculus learning process is the lack of students active participation during the learning process. They quickly forget the lecture material even though the material has just been delivered, consequently they are getting difficulties to understand the next material. This situation can be caused by the following things: (1) the lack of students learning motivation in Calculus learning, (2) students do not prepare themselves before the learning process begins even though the material which will be delivered is already known, (3) the absence of Calculus teaching materials as the learning capital students, (4) students are less enthusiastic in participating in Calculus learning.

Overall, these conditions arise due to the absence of learning resources that can be used by students to explore all the potential that exists in them according to their ability level. The use of differentiated instruction based learning modules can improve student learning outcomes. Therefore researchers are interested to find out how the use of differentiated instruction-based learning modules influence mathematics learning motivation of students of Informatics Engineering study program at University of Darussalam Gontor.

Based on preliminary explanation, the objectives of this study were (1) to find out the differences of student mathematics learning motivation before and after the use of differentiated instruction based learning modules, (2) to find out the effect of using differentiated instruction-based learning modules on student mathematics learning motivation.

2. Methods

This research was an experimental study that used the One Group Pre-test – Post-test Design method. The design of this study was by looking at the differences in the effects of a treatment in the form

of learning using differentiated instruction based modules which would be tested by comparing the condition of the independent variable namely mathematics learning motivation before and after being given the treatment.

The subjects of this study were students of the Informatics Engineering Study Program of Darussalam Gontor University in the first semester who took Calculus course as many as 24 students. They were lectured by using differentiated instruction-based learning modules in equation and inequality of absolute value. Also, the learning was carried out in 3 meetings by using the Team Assisted Individualization (TAI) learning method. This research was conducted in the odd semester in the academic year 2018/2019.

For more, the data collection techniques of this study were observation and questionnaires. First, the observation was done by conducting direct observations on the subject of the study in case to find out students activities during the learning which used differentiated instruction based modules. The results of the observations were analyzed qualitatively.

Second, questionnaires were carried out to determine students' motivation to learn mathematics with the use of differentiated instruction based modules. Questionnaires were compiled as many as 20 questions which students must answer. Furthermore, the content questions were in line with the indicators of mathematics learning motivation. The questionnaires were in the form of multiple choices with 5 answer choices so that for each answer choice was given a value based on the Likert scale with a choice of answers, namely the value 5 (always), value 4 (often), value 3 (sometimes), value 2 (rare), and value 1 (never). Afterwards, the qquestionnaire data were used to measure students' mathematics learning motivation.

The collection of motivational questionnaires was done at the beginning and end of the learning process. The statistical analysis technique which was used in this study was the T-Test (paired sample T-Test with analysis prerequisites namely normality and homogeneity test). To simplify the calculation and analysis, this study carried out with the help of computers through IBM SPSS 20.

The normality test was performed to determine whether the data were normally distributed or not. Even more, the normality test of this study was the Kolomgorov–Smirnov test at a significance level of 5%. The prerequisites decision making which was by using probability values (Sig) 5 0.05 meant that the data were normally distributed.

The homogeneity test was performed to determine whether the variances of a number of populations were the same or not. The homogeneity test used was the Levene's Test at a significance level of 5% or 0.05, with the decision-making requirements which was by using probability values (Sig) 5 0.05, then the variance between the two groups was the same.

Meanwhile, the significance test of the difference of the average value of the questionnaire before and after the use of differentiated instruction based module was by using the Paired Sample T-Test. The significance of the difference in learning motivation was determined by looking at the probability value (sig-2 tailed). If the Sig-2tailed value was ≥ 0.05 then it can be concluded that there was no significant difference of learning motivation before and after the use of differentiated instruction based module. If the Sig-2tailed value was <0.05, it can be concluded that there was significant differences of learning motivation before and after the use of differentiated instruction based module.

The influence of the use of differentiated instruction-based modules on students' mathematics learning motivation was determined through the correlation test of the learning motivation questionnaire before and after the use of the module. Quadratullah (2014) explains that the connection strength level between two variables to 5 levels, namely perfect, very strong, strong, weak, and very weak. The connection level between two variables is presented in **T**able 1.

Table 1. The Connection Level between Two Variables

Correlation Coefficient (r_{xy})	Connection Level
$r_{xy} = 1$	Perfect
$0.75 \leq r_{xy} < 1$	Very strong
$0.5 \leq r_{xy} < 0.75$	Strong
$0.25 \leq r_{xy} < 0.5$	Weak
$0 < r_{xy} < 0.25$	Very weak
$r_{xy} = 0$	None

3. Results and Discussion

This study used two types of data, namely student learning motivation questionnaire data before and after the use of learning module. As well as mentioned on the preliminary explanation there were two objectives of this study, namely to find out the differences in students' mathematics learning

motivation before and after the use of differentiated instruction based module and the influence of the use of modules on students' mathematics learning motivation.

The assessment of student mathematics learning motivation was carried out before and after the treatment, namely learning by using differentiated instruction based module. In brief, the result of student mathematics learning motivation questionnaires before and after treatment is presented in Table 2.

Table 2. The Description of Learning Motivation Questionnaire Result

Statistic	Motivation (before)	Motivation (after)
The Average	81,71	84,88
Maximum value	89	94
Minimum value	74	77
Standard Deviation	4,648	5,424
Variance	21,607	29,418

Based on Table 2, it can be seen that students' motivation to learn Mathematics before the use of differentiated instruction-based module had an average value of 81.71 with the highest score of 89 and the lowest value of 74. Meanwhile, the students' mathematics learning motivation after the module used had an average value of 84.88 with the highest score of 94 and the lowest score of 77. From the average value of learning motivation data before and after the use of module, it can be noted that there were differences in the average of 3.17. Further, to find out whether the average difference was significant or just a coincidence, it was necessary to analyze statistical data by using a paired sample t-test. It went without saying that before the paired sample t-test was carried out, a prerequisite analysis must be performed, namely the normality and homogeneity test. All of the tests were supported by IBM SPSS 20. The following explanation are the results of testing data by using IBM SPSS 20.

3.1. Prerequisite Analysis Test

3.1.1. Normality Test

The normality test was used to determine whether the distribution of data was normally distributed or not. The normality test was carried out by using the Kolmogorov-Smirnov test. The results of the normality test of learning motivation questionnaire data before and after the use of differentiated instruction based module is briefly presented in Table 3.

Table 3. The Summary of the Normality Test Result

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Before	.163	24	.101	.942	24	.178
After	.160	24	.113	.926	24	.080

a. Lilliefors Significance Correction

From table 2, it can be noted that the significance value (Sig) for module usage questionnaire data and learning motivation is 0.200 at a significance level of 0.05. These results indicated that both data were normally distributed.

3.1.2. Homogeneity Test

The homogeneity test was used to determine whether the variances of a number of populations were the same or not. The homogeneity test took the Levene's Test by using a significance level of 5% or 0.05. The result of the homogeneity test of the two data is briefly presented in table 4.

Table 4. **Table 4.** The Summary of Homogeneity Test Result

Levene Statistic	df1	df2	Sig.
2.777	7	9	.078

Based on table above, it can be seen that the Levene's Test test result showed a probability value (Sig) of 0.78 which was greater than 0.05. Thus, it can be concluded that both data were the same (homogeneous).

3.2. The Average Difference Test

The average difference test was used to determine whether there was a significant difference between the average learning motivation results before and after the use of differentiated instruction based module. The result of average difference test in learning motivation data is presented in Table 5.

Table 5. The Summary of the Average Difference Test Result

Statistic	Calculated Value
Mean Deviation	-3,167
Std. Deviation	3,266
Std. Error Mean	0,667
T	-4,750
Df	23
Sig. (2-tailed)	0,000

Table 5 notes that the probability value (Sig) of 0,000 which was less than 0.05. Shortly, there were significant differences between the average result of student mathematics learning motivation before and after the use of differentiated instruction based module. Eventually, the difference in average learning motivation before and after the use of modules was negative. In other words, the average students' mathematics learning motivation after the use of modules was greater than before using the module.

3.3. Learning Motivation Correlation Test

The correlation of students' mathematics learning motivation before and after the use of module can be known by using the Paired Samples Correlations test which is presented in table 6.

Table 6. The Result of Paired Samples Correlations Test

		N	Correlation	Sig.
Pair 1	Before and After	24	0.800	0.000

Based on table 6, it can be seen that the correlation coefficient was obtained at 0.800 which means that students' mathematics learning motivation was influenced by the use of differentiated instruction based learning module as much as 80%, while the remaining 20% was influenced by other factors. It showed that the use of differentiated instruction based learning module had a very strong influence toward students' mathematics learning motivation. The significance of the correlation coefficient shows that the Sig value of 0.000 was less than 0.05. It means that the correlation coefficient can be used to predict how much influence the use of differentiated instruction-based learning module on students' mathematics learning motivation.

3. Conclusion

Based on the results of previous research and discussion, there are several conclusion which can be drawn, as follows: (1) there is a significant difference between mathematics learning motivation before and after the use of differentiated instruction based module. Students' mathematics learning motivation after the use of modules is higher than before using the module, and (2) there is the influence of the use of differentiated instruction-based learning module toward students' mathematics learning motivation with a correlation coefficient of 0.800 which means that students' mathematics learning motivation is influenced by the use of differentiated instruction based learning module of 80% while the remaining 20% is influenced by other factors.

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