COMPARISON OF STUDENT MATH LEARNING OUTCOMES BETWEEN SPIRAL METHODS AND LECTURE METHOD

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Abstract. This research aims to find out the differences in student learning outcomes between students who are taught using the spiral method and the teaching method of the concept of class VII of Muhammadiyah Ambon Junior High School. The type of research used is quantitative, with a sample of 56 people consisting of a control class of 28 people and an experimental class of 28 people. The instruments used are tests and observations. Tests are used to determine the learning outcomes of students taught using lecture methods, and spiral and observation methods are used to determine the learning conditions. The data analysis technique used is to use two-party t-tests. Based on the results of the data analysis, it was obtained that there were differences in student learning outcomes between students who were taught using spiral methods and lecture methods of the concept of class VII of Muhammadiyah Ambon Junior High School. The results are based on the results of hypothesis testing conducted using the t-test with the result of t_{value} obtained a value of 7.024. While the conversion result based on the t value distribution table is in the two-party test with db = 54, obtained a ttabel value of 2,000. In other words it can be said that $-t_{table} \leq t_{value} > t_{table}$ or $-2,000 \leq 7,024 > 2,000$.

Keywords: Lecture Methods, Spiral Methods, Learning Outcomes, Sets

Abstrak. Penelitian ini bertujuan untuk mengetahui perbedaan hasil belajar siswa antara siswa yang diajarkan dengan menggunakan metode spiral dan metode ceramah konsep himpunan kelas VII SMP Muhammadiyah Ambon. Jenis penelitian yang digunakan adalah kuantitatif dengan jumlah sampel sebanyak 56 orang terdiri dari kelas kontrol yakni 28 orang dan kelas eksperimen 28 orang. Instrumen yang digunakan yakni tes dan observasi. Tes digunakan untuk mengetahui hasil belajar siswa yang diajarkan dengan menggunakan metode ceramah dan metode spiral dan observasi digunakan untuk mengetahui kondisi pembelajaran yang berlangsung. Teknik analisis data yang digunakan yakni menggunakan uji-t dua pihak. Berdasarkan hasil analisis data diperoleh bahwa terdapat perbedaan hasil belajar siswa antara siswa yang diajarkan dengan menggunakan metode spiral dan metode ceramah konsep himpunan kelas VII SMP Muhammadiyah Ambon. Hasil tersebut didasarkan pada hasil pengujian hipotesis yang dilakukan dengan menggunakan uji-t dengan hasil t_{hitung} diperoleh nilai 7,024. Sementara hasil konversi berdasarkan tabel distribusi nilai t yakni pada uji dua pihak dengan db = 54, diperoleh nilai t_{tabel} yakni sebesar 2,000. Dengan kata lain dapat dikatakan bahwa $-t_{tabel} \leq t_{hitung} > t_{tabel}$ atau $-2,000 \leq 7,024 > 2,000$.

Kata Kunci: Metode Ceramah, Metode Spiral, Hasil Belajar, Himpunan

INTRODUCTION

The teaching and learning process will always be a process of interaction between two human elements, namely students as learning parties and teachers as teaching parties, with students as the main subject (Deniz, 2017; Ellis et al., 2014). The interaction process between students and teachers needs supporting components such as others in the characteristics of educational interaction. Corey revealed that learning is a process by which a person's environment is deliberately managed to allow him or her to participate in certain behaviours under special conditions or produce a response to a particular situation (Sagala, 2003). The teaching and learning process is one of them characterized by student activities. Consequently, if students are central, student activities are an absolute condition for ongoing teaching and learning. Student activity, in this case, is both physically and mentally active to the concept of how to learn active students. So there is no point in teachers carrying out teaching and learning interaction activities if students are only passive because the students are the ones who learn, then they are the ones who should do it (Methe, 2012).

Most teaching and learning processes in schools ranging from the lowest to the highest level are classically implemented (Kamsurya & Masnia, 2021). Learning in the classroom is carried out using the lecture method as the dominant learning method, citing limited time and learning material achievement targets. The lecture method tends to rely solely on the activeness and ability of the teacher. The teacher actively teaches by informing several facts, concepts, and principles. While more students sit silently, accepting what the teacher conveys (Mudjiono & Hasibuan, 2012).

Learning is not memorization and not remembering. Learning is a process characterized by changes in a person (Kung et al., 2021). Changes as a result of the process can be shown in various forms, such as changing his knowledge, experience, attitude and behaviour, his skills, his skills and abilities, his reaction power, his acceptance power, and other aspects that exist in the individual (Keklikci & Saka, 2019; Sudjana, 2006). Learning will be more meaningful if the child experiences what he learns, not just knowing it. According to James O. Whittaker, learning can be defined as how behaviour is elicited or altered through practice or experience (Ahmad, 2005).

SMP Muhammadiyah Ambon is one of the schools located in Central Maluku Regency. In this area, education is one of the crucial sectors that are an essential point of concern for the government. Based on the results of preliminary observations made by researchers, mathematics learning in the school tends to be monotonous and does not motivate students. The teacher in his education only conveys the material he teaches, regardless of the student's

level of understanding. The learning is not very student-oriented, even though the Kurikulum Tingkat Satuan Pendidikan (KTSP) emphasizes student activities in the learning process. Teachers only act as facilitators in helping students understand the material taught.

One of the better ways to encourage students to be actively involved in finding concepts in the teaching and learning process is to do learning using a spiral approach with a spiral approach in teaching and learning activities oriented to students. The learning process starts from the easy and concrete and goes into the difficult or abstract. That way, it will train the mindset of students to solve every problem in the world of mathematics. The spiral approach can be used as an alternative in mathematical learning on the subject matter of the set. Through this approach, the knowledge and skills obtained by students are not the results of remembering a set of facts but rather the results of finding their own.

METHOD

The type of research used in this research is quantitative, comparative studies that aim to compare student learning outcomes between students taught with spiral methods and lecture methods of class VII set concepts of Muhammadiyah Ambon Junior High School. The population in this study is the entire class VII of Muhammadiyah Ambon Junior High School, which consists of two classes, namely class VII^1, with some students 28 people and class VII^2, with several students 28 people. The total population is 56. The sample is part of the number and characteristics that the population has (Sugiyono, 2013; Sumargo, 2020). The sampling technique in this study used random sampling (Djauhari, 2020), where the sampling process was carried out randomly between classes VII^1 and VII^2. In this study, class VII^1 students were taught using lecture methods (control classes), and class VII^2 students were taught using the spiral method (experimental class).

The variables in this study consist of two, namely, student learning results using the lecture method. Indicators of student test scores are obtained in implementing the final test (X1). Student learning results using a spiral method with indicators of student test scores obtained in the implementation of the final test (X2). The instruments used in the research are test and non-test instruments. Test instruments are used after students learn using spiral methods and lecture methods. Tests are conducted to determine the student's learning results after studying the set using spiral and lecture methods. Non-test instruments, namely observations, are used to objectively determine learning conditions at the research location by teachers using spiral methods and lecture methods.

Data analysis consists of descriptive statistical analysis, which calculates the average value, mode, standard deviation, and variance. Inferential analysis used to examine hypotheses is by using the t-test test. Before conducting an inferential test, the analysis prerequisite test is first carried out.

$$t_{value} = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{(n_1 - n_2)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

Information:
n_1 and n_2 = number of samples
$\bar{x}_1$ = average of the 1st sample
$\bar{x}_2$ = average of the 2nd sample
S_1 = standard deviation of the 1st sample
S_2 = standard deviation of the 2nd sample
s_1^2 = 1st sample variance
s_2^2 = 2nd sample variance (Sugiono, 2007).

Testing is carried out using a two-way t-test with those carried out with the following test criteria.

H_0 is accepted, and H_1 is rejected if $-t_{table} \leq t_{value} \leq t_{table}$.

H_0 is rejected, and H_1 is accepted if $-t_{table} \leq t_{value} \geq t_{table}$

RESULTS

Data collection in this study uses tests carried out on students who study using lecture methods and spiral learning methods. Based on the data that has been collected, including data on initial test scores and final tests in 56 students consisting of control classes, namely students who learn using lecture methods. As many as 28 students and experimental classes, namely students who learn using spiral learning methods as many as 28 students. Both groups were given a pretest to measure students' initial knowledge of the set material. Then the post-test is given after each group conducts a teaching and learning process with different treatment and aims to measure the improvement of student learning outcomes in understanding the material.

Description of Student Initial Test Results Using Lecture Methods (X₁)

The initial test of students is carried out on all students of class VII1, which will later be taught using the lecture method. The purpose of the initial test is so that later it can be

known the initial ability of students in the set material. The initial test results of students in the class are as follows.

Table 1. Student initial test results in class VII$_1$ (Lecture Method)

Qualification	Frequency	Percentage	Value	Predicate
80 – 100	0	0,00%	A	Excellent
66 – 79	2	07,14%	B	Good
56 – 65	11	39,29%	C	Enough
40 - 55	14	50,00%	D	Less
0 – 39	1	3,57%	E	Fail
Total	**28**	**100%**		

Source: Student's initial test results in the lecture class

Based on table 1 above, the analysis of the results of the initial test of students conducted in the control class, it is known that of the 28 students who obtained test results in the initial test implementation, there were no students in the excellent category. Students who scored in the excellent category amounted to 2 people with a percentage of 7.14%, the rest who obtained test results in the category were quite 11 people with a percentage of 39.29%, Students who obtain test results in the category are less than 14 people with a percentage of 50.00%. In contrast, students who obtain test results in the failed category are 3.57%.

Description of Student Initial Test Results Using Spiral Method (X$_2$)

The initial test was conducted on all students in VII2, which amounted to 28 people. The initial test is carried out to know the student's test results on the set material before applying spiral learning methods to the class. The initial results of students in the class to be taught using the spiral method are presented in the following table.

Table 2. Student's initial test results in spiral method class

Qualification	Frequency	Percentage	Value	Predicate
80 – 100	0	0,00%	A	Excellent
66 – 79	15	53,57%	B	Good
56 – 65	13	46,43%	C	Enough
40 - 55	0	0,00%	D	Less
0 – 39	0	0,00%	E	Fail
Total	**28**	**100%**		

Source: Students' initial test results in spiral method classes

Based on table 2 above, the analysis of the results of the initial test of students conducted of the 28 students who obtained test results in the initial test implementation, there were no students in the excellent category. Students who obtained grades in the excellent

category amounted to 15 people with 53.57%, and students who obtained test results in the category were quite 13 people with a percentage of 46.43%. No student obtained test results in the lessor failed category.

Description of Student Final Test Results Using Lecture Methods (X₁)

To find out the student's learning results obtained in the implementation of the final test after going through the learning process carried out using the lecture method can be seen in the following table.

Table 3. Student test results using lecture methods (X_1)

Qualification	Frequency	Percentage	Value	Predicate
80 – 100	1	3,57%	A	Excellent
66 – 79	14	50,00%	B	Good
56 – 65	11	39,29%	C	Enough
40 - 55	2	7,14%	D	Less
0 – 39	0	0,00	E	Fail
Total	**28**	**100%**		

Source: control class student final test result data (X_1)

Based on table 3 above, the analysis of student test results conducted using the lecture method is known as the 28 students who obtained test results in the excellent category amounted to 1 person with a percentage of 3.57%. Students who scored in the excellent category amounted to 14 people with a percentage of 50.00%, and students who obtained test results in the category were quite 11 people with a percentage of 39.29%. Students who obtained test results in the category were less than two people with a percentage of 7.14%, while none of the students who obtained test results in the failed category.

In addition, a descriptive analysis of the learning results is carried out to find out the average score, variance and standard deviation of the learning outcomes of students who carry out learning using the lecture method. Based on the results of descriptive analysis of the student's final test result, data was obtained as follows:

Table 4. Descriptive analysis with lecture methods (X_1)

Category	Score
Sample Count	28
Average Value	67,04
Variance	58,04
Standard Deviation	7,62
Mood	68,5
Median	67,21
Coefficient varians	11,37%

Based on table 4 above, it can be known that student learning results are carried out using the lecture method. Based on the results of data analysis, an average score of 67.04, a variance of 58.04, a standard deviation of 7.62, mode 68.5, and a significant coefficient variance of 11.37%.

Description of Student Final Test Results Using Spiral Method (X₂)

To find out the student's learning results obtained in the implementation of the final test after going through the learning process carried out using spiral learning methods can be seen in the following table.

Table 5. Student test results using spiral method (X_2)

Qualification	Frequency	Percentage	Value	Predicate
80 – 100	14	50,00%	A	Excellent
66 – 79	14	50,00%	B	Good
56 – 65	0	0,00%	C	Enough
40 - 55	0	0,00%	D	Less
0 – 39	0	0,00	E	Fail
Total	**28**	**100%**		

Source: final test result data of experimental class students (X2)

Based on table 5 above, the analysis of student test results conducted using the lecture method is known that of the 28 students who obtained test results in the excellent category, there were 14 people with a percentage of 50.00%, and students who scored in the excellent category amounted to 14 people with a percentage of 50.00%. No students obtained test results insufficient categories, Less, and failed.

In addition, descriptive analysis of the learning results is carried out to find out the average grades, variances, and standard deviations of student learning outcomes that carry out learning using spiral learning methods. Based on the descriptive analysis of student final test results, data were obtained as follows.

Table 6. Descriptive analysis by spiral method (X_2)

Category	Score
Sample Count	28
Average Value	80,21
Variance	40,367
Standard Deviation	6,35
Mood	85,79
Median	79,5
Coefficient Varians	7,92%

Source: Data processing results

Based on table 6 above, it can be known that student learning results are carried out using lecture methods. Based on the results of data analysis with the number of students, as many as 28 students obtained an average score of 80.21, a variance of 40,367, a standard deviation obtained which is 6.35 mode 85.79, and a significant coefficient variance of 7.92%.

Data Normality Test

The data normality test is carried out to determine the normality or absence of data obtained in implementing the research process. The data normality test is performed using a chi-squared test with test criteria:

If $x^2_{value} \geq x^2_{table}$ then the data is distributed abnormally

If $x^2_{value} < x^2_{table}$ then the data is distributed normally

The data normality test on variable X1 and variable X2 using the chi-squared formula is obtained that (1) in variable X1 (end test result of control class) obtained values from $X^2_{value} = 3,28$ dan $X^2_{table} = 9,488$. Thus $X^2_{value} < X^2_{table}$ or $3,28 < 9,488$. So it can be concluded that the variable X1 is distributed normally, and (2) variable X2 (the final test result of the experimental class) is obtained values from $X^2_{value} = 3,25$ dan $X^2_{table} = 9,488$. Thus $X^2_{value} < X^2_{table}$ or $3,25 < 9,488$. So it can be concluded that variable X2 is distributed normally.

Data Homogeneity Test

Data homogeneity tests are carried out to determine whether or not the data obtained in the implementation of the research process. The data homogeneity test is performed using the F test with test criteria:

If $F_{value} \geq F_{table}$ Is not homogeneous

If $F_{value} < F_{tablel}$ homogeneous

Based on the test results, it was obtained that the $F_{value} = 1,438$. While the value of F_{table} is 1,88. Thus it can be said that the value of $F_{value} < F_{table}$ atau $1,438 < 1,88$. Based on the above test criteria, it can be concluded that the data obtained is homogeneous. This means that the data obtained comes from the same variance

Hypothesis Testing

Hypothesis testing is a stage that is carried out to test the hypothesis that has been made against a problem study. Two samples were conducted to find out the difference in student

learning outcomes between students who are taught using the spiral method and the lecture method of the concept. Testing is carried out on a two-way test with the test criteria, namely:

If $-t_{table} \leq t_{value} \leq t_{table}$ then H0 is accepted and H1 is rejected

Table 7. Results of the two-sample t-test between the lecture method (X1) and the spiral method (X2)

Variable	t_{value}	t_{table}	
		Db	**0,025**
X_1 and X_2	7,024	$N - 2$	2,000
		$56 - 2 = 54$	

Source: data analysis results (t-test)

Based on the results of the hypothesis test using the t-test of the two samples above, it can be known that the t_{value} result obtained a value of 7,024. While the conversion result based on the t value distribution table is in the two-party test with db = 56, obtained a ttabel value of t_{tabel} is 2,000. In other words it can be said that $-t_{table} \leq t_{value} > t_{table}$ or $-2,000 \leq 7,024 > 2,000$. Based on the above results, it can be concluded that H_0 is rejected because $-t_{table} \leq t_{value} > t_{table}$ or in other words H_1 is accepted. Then, there is a difference in student learning outcomes between students who are taught using the spiral method and the lecture method of the concept of class VII of Muhammadiyah Ambon Junior High School.

DISCUSSION

To realize the activeness of students, the selection of the correct learning methods and models by teachers in learning is an essential factor (Munawaroh, 2018; Spina, 2017), because the learning methods and learning models will stimulate students to play a more active role in the learning process (Bećirović et al., 2019). One of the learning methods that teachers in mathematics learning can use is the spiral method. The spiral method is learning that places students as a subject of learning. In the spiral learning method, the form of questions or problems given by teachers is given by students' level of ability and understanding, namely the questions given starting from the easy nature to the form of difficult questions (Giselsson, 2020). This is intended so that students can gradually learn mathematical materials, especially set materials (Hermond & Tanner, 2020). In the learning process with spiral learning methods in this learning, the student looks active and motivated to follow learning activities. Learners look so enthusiastic to participate in learning activities and feel responsible. In their learning, every learner is directly involved in learning, and each

learner is given the responsibility to complete their respective tasks (Çelik & Özdemir, 2020; Kolar & Hodnik, 2021).

Based on the results of research obtained from student test results, it can be seen that in the implementation of the final test using the lecture method, test results were classified as not very good. The results are evidenced by the test results achieved, namely from 28 students who took the final test. The number of students who obtained test results in the category was excellent, amounting to 1 person or with a percentage of 3.57%. The number of students who obtained test results category either amounted to 14 people or with a percentage of 50.00%. The number of students who obtained test results in good categories amounted to 11 people or with a percentage of 39.29%, and students who obtained test results in the less category were two people or with a percentage of 7.14%, and no students who obtained test results in the category of failure.

Different things happen to the learning process that is carried out using spiral learning methods (Gunawan et al., 2020; Kaygisiz et al., 2020). Apart from students' activeness in the learning process, in terms of test results, they get excellent results. This is evidenced by the results of the final test implementation, namely from 28 students who took the final test and students who obtained test results in the excellent category, namely 14 people or with a percentage of 50.00%. The number of students who obtained test results in the category either amounted to 14 people or with a percentage of 50%, and no students obtained test results insufficient categories, Less and failed.

The results showed that the learning process using the spiral method obtained better test results. This is because the learning process using the student's spiral method is more active in the learning process. Other results can be seen from the classical average obtained, namely in the implementation of the final test of the average score control class obtained at 67.04 and increased in the implementation of the final test whose average score obtained was 80.21.

Based on the results of the hypothesis test using the t-test, the t_{value} result obtained a value of 7,024. While the conversion result based on the t value distribution table is in the two-party test with db = 54, obtained a t_{table} value of 2,000. In other words it can be said that $-t_{table} \leq t_{value} > t_{table}$ or $-2,000 \leq 7,024 > 2,000$. Based on the above results, it can be concluded that H_0 is rejected because $-t_{table} \leq t_{value} > t_{table}$ or in other words H_1 is accepted. Then it can be said that there is a difference in student learning outcomes between students who are taught using the spiral method and the lecture method of the concept of class VII of Muhammadiyah Ambon Junior High School.

CONCLUSION

Based on the results of the above research, it can be concluded that there is a difference in student learning outcomes between the spiral method and the lecture method of the concept of class VII of Muhammadiyah Ambon Junior High School. The results are based on the results of hypothesis tests conducted using the t-test and KV values. The results of the analysis using the t-test obtained a t_{value} result obtained a value of 7,024. While the conversion result based on the t_{value} distribution table is in the two-party test with db = 54, obtained a t_{table} value of 2,000. In other words it can be said that $-t_{table} \leq t_{value} > t_{table}$ atau $-2,000 \leq 7,024 > 2,000$. With these results it was concluded that H0 was rejected and H1 was accepted. While the KV value obtained is $KV_b \leq KV_a$ or $7,92\% \leq 11,37\%$.

RECOMMENDATIONS

Based on the above conclusions, there are several things that the author can suggest, namely (1) it is expected to the mathematics teacher to be able to spiral learning methods so that it can improve the learning outcomes obtained by students, and (2) Research is still limited to student learning outcomes and on the concept of the set, so it should be for advanced researchers to be able to carry out further research in a wider context.

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