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The Effect of Implementing Bruner's Theory on the Fourth Grade Students' Learning Outcomes on Plane Figures Circumference at Sdn 3 Panderejo Banyuwangi

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Abstract: *The aim of this study was to established whether or not there was a significant influence on the Bruner's theory to the learning outcomes of the two-dimensional figure to the fourth grade students of SDN 3 Panderejo Banyuwangi. The research method used was experimental research with Quasi-Experimental Designs research form and The Nonequivalent Control Group Design research design. Data analysis used was a separate sample t-test formula using SPSS. The participants of this study were 36 students in fourth grade students of SDN 3 Panderejo Banyuwangi. The data result obtained from the differentiation of the data in the average value of pretest and posttest, the experimental class were 13 and the control class were 12.63889. T-test results with 34 percent significance db obtained ttable 0.339, while the tcount 7.989. Based on the analysis obtained 7,989 greater 0,339, the results presents that there was a significant influence on the application of the Bruner theory to student learning outcomes in the subject of rectangular, square and triangular shapes in fourth grade SDN 3 Panderejo Banyuwangi.*

Keywords: Bruner Theory, Learning Outcomes, Two-Dimensional Figure

1. INTRODUCTION

Based on the results of the interview, however, the teacher still implements the discussion method, question and answer, and assignments. In the teaching learning process, the teacher's principles apply non-concrete media or objects that could be deployed by students. Students only listen to the teacher, pay attention to the textbooks, giving question and answer to the students then solve the problems. The majority of the students are not intersting on the mathematics because they suffer boring and students playing lonely and do not pay attention to the teacher while they are teaching. In addition, it requires the ability to memorize and calculate using formulas. The students' knowledge on the learning mathematics is still weak. This could be obtained from the results of interviews conducted with teachers and fourth grade students at SDN 3 Panderejo Banyuwangi.

According to Azmi, et al. (2020) explains that there are significant differences in learning outcomes among the students group which take part in learning with Bruner's theory and groups of students who do not use Bruner's theory in its application. It proves that Bruner's theory effects the learning outcomes of the material in the volume of space in Kebonsari 04 Jember Primary School. According to Masitoh, et al. (2020) declares that the cooperative learning model in the application of images and the type of images has an effect on learning outcomes of fourth grade of SMP Dasarmalang 1 Jombang. According to Cholilatuz (2011) argues that the application of Bruner's theory could increase the activeness and learning outcomes of students in learning the flat shape in third grade students SDN Kauman 3 Malang.

Implementing the theory of learning Bruner is the action that could be organized by the teacher to teach the subject around the flat shape. Bruner's learning theory emphasizes learning to the stages of cognitive development, such as enactive stage, the iconic stage, and the symbolic stage, Thus, Instruction of mathematical concept will be more meaningful. Not only understanding the mathematical concept, but also knowing the application in everyday life.

Several things that are needed to be considered by the teacher with the purpose of to enhance mathematical concepts especially around the flat shape. Therefore, the teacher are suggested to help students being understand in applying of a flat shape. That are represented with 1) Enactive stage, students might be able to learn the knowledge in an active way, using concrete objects which are around them. In this demonstration, students do not use words or imagination. Students get something innovative by doing something, 2) Iconic stage, students do not directly manipulate objects as students do at the enactive stage. In this stage the learning of knowledge is obtained in the form of visual images, diagrams, or pictures, 3) The symbolic stage, students are no longer related to objects as in the previous stage. At this stage students are able to use notation without relying on real objects. In this stage can use the form of verbal symbols (such as sentences, letters, words) or mathematical symbols, the theory is better known as Bruner's learning theory. Based on the description above, the formulation of the problem in this study was formulated, "Is

there any significant influence on the application of Bruner's theory to the learning outcomes of the two-dimensional figure in fourth grade students at SDN 3 Panderejo Banyuwangi?"

2. RESEARCH METHOD

The design of the research used in this study was quasi-experimental designs. In the quasi-experimental pattern was distribute into several parts and this study used the pattern of The Nonequivalent Control Group Design. The formula can be described as follows.

$$E : Q_1 \; x \; O_2$$
$$_C : O_1 \; x \; O_2$$

Figure 1. The Research Design of The Nonequivalent Control Group Design

Explanaton :
E = Experimental Group
C = Control Group
O1 = Observation/ Early Test (pretest)
X = Treatment Given
O2 = Observation/ Late Test (posttest)

The participants of this study were fourth grade students at SDN 3 Panderejo Banyuwangi, around 36 students. Students were divided into two group for the control and experimental group as the technique to divide into categories of midterm test. Midterm test are grouped based on high, medium, and low grade levels using the formula of grade test according to Azwar (2012). High grades consisted of 6 students, medium grades consisted of 26 students, and low grades consisted of 4 students. Based on the results of the division of values obtained in each category the grade level was divided into 2 and produce 2 groups that were equally leveled, namely class A and class B, to determine the homogeneity test was using the SPSS program. Obtained a significant coefficient of 0.713. The significant coefficient was compared with a significance level of 0.05. The results of the comparison showed the significant coefficient was greater than the significance level of 0.05 so that it get (0.713> 0.05). Thus it could be concluded that there was no significant difference between the two groups or could be called homogeneous. The variables involved in this study were Bruner's learning theory as the independent variable and learning outcomes as the dependent variable.

The data collection technique used was a test. Learning outcomes tests were arranged to measure the level of individual achievement after learning a certain material. The test used was in the form of a written test and it would be given at the time of the pretest and posttest. Then it tested for data analysis using the t-test for separate samples. The difference between the F test and the T test was the F test used to measure the magnitude of the difference in variance between the two or several groups. Whereas the T test was a test that measured the difference between two or more among the groups. The research instruments were 3 questions validated by 2 Jember University mathematics education lecturers and 1 school principal at SDN 1 Lateng Banyuwangi. The result of calculating the instrument's worth was 95.23%.

The steps of the research by giving difference treatment to two classes, the experimental class and the control class were apllied different methods. The first step was the two classes were given a pretest to find out the students' initial abilities, then different treatments were given to the two different classes. Experimental class was applied with Bruner's learning theory which had three interrelated stages namely enactive, iconic and symbolic stages. Bruner's theory was supported by tangible objects that could be seen and held by students, so that they could progress in the learning process, especially the subject of flat construction. Applying Bruner's theory was very important to be given interms of mathematical concepts were arranged in a hierarchical learning of mathematical concepts. Previously it had become a requirement for taking a more complex concept, so the students must be mastered the concept comfortably in order to be able to understand the next concept. The control group used the teaching learning method and assignments to the material around the rectangular, square and triangular shape. After the two classes were acquired treatment according to the RPP, then both classes will be given a Posttest. the results are analyzed using the SPSS version 24. The data were analyzed in the form of different result of pretest and posttest to the experimental group and the control group then analyzed for hypothesis testing. This study proposed the formulation of statistical hypotheses as follows. There was a significant influence on the application of Bruner's theory to the learning outcomes of the two dimentional subject to the fourth grade students of SDN 3 Panderejo Banyuwangi students.

3. RESULT AND DISCUSSION

This research employed different pretest and posttest with dissimilar questions, before the treatment conducted, the students were given pretest questions to decide students' initial concept, after the treatment the students were assumed posttets about the final test. The pretest and posttets were sketched in Figures 2 and 3 below.

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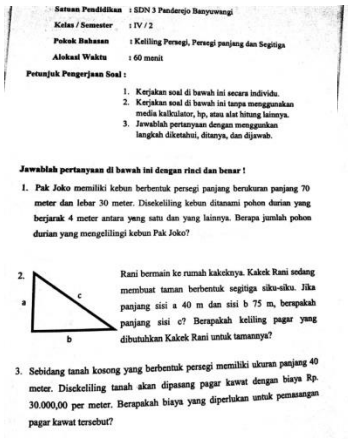
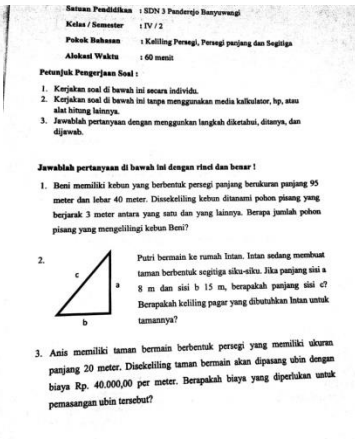


Satuan Pendidikan : SDN 3 Panderejo Banyuwangi
Kelas / Semester : IV / 2
Pokok Bahasan : Keliling Persegi, Persegi panjang dan Segitiga
Alokasi Waktu : 60 menit
Petunjuk Pengerjaan Soal :
1. Kerjakan soal di bawah ini secara individu.
2. Kerjakan soal di bawah ini tanpa menggunakan media kalkulator, hp, atau alat hitung lainnya.
3. Jawablah pertanyaan dengan menggunkan langkah diketahui, ditanya, dan dijawab.

Jawablah pertanyaan di bawah ini dengan rinci dan benar !
1. Pak Joko memiliki kebun berbentuk persegi panjang berukuran panjang 70 meter dan lebar 30 meter. Disekeliling kebun ditanami pohon durian yang berjarak 4 meter antara yang satu dan yang lainnya. Berapa jumlah pohon durian yang mengelilingi kebun Pak Joko?
2. Rani bermain ke rumah kakeknya. Kakek Rani sedang membuat taman berbentuk segitiga siku-siku. Jika panjang sisi a 40 m dan sisi b 75 m, berapakah panjang sisi c? Berapakah keliling pagar yang dibutuhkan Kakek Rani untuk tamannya?
3. Sebidang tanah kosong yang berbentuk persegi memiliki ukuran panjang 40 meter. Disekeliling tanah akan dipasang pagar kawat dengan biaya Rp. 30.000,00 per meter. Berapakah biaya yang diperlukan untuk pemasangan pagar kawat tersebut?

Figure 2. Question *Pretest*



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2. Kerjakan soal di bawah ini tanpa menggunakan media kalkulator, hp, atau alat hitung lainnya.
3. Jawablah pertanyaan dengan menggunkan langkah diketahui, ditanya, dan dijawab.

Jawablah pertanyaan di bawah ini dengan rinci dan benar !
1. Beni memiliki kebun yang berbentuk persegi panjang berukuran panjang 95 meter dan lebar 40 meter. Disekeliling kebun ditanami pohon pisang yang berjarak 3 meter antara yang satu dan yang lainnya. Berapa jumlah pohon pisang yang mengelilingi kebun Beni?
2. Putri bermain ke rumah Intan. Intan sedang membuat taman berbentuk segitiga siku-siku. Jika panjang sisi a 8 m dan sisi b 15 m, berapakah panjang sisi c? Berapakah keliling pagar yang dibutuhkan Intan untuk tamannya?
3. Anis memiliki taman bermain berbentuk persegi yang memiliki ukuran panjang 20 meter. Disekeliling taman bermain akan dipasang ubin dengan biaya Rp. 40.000,00 per meter. Berapakah biaya yang diperlukan untuk pemasangan ubin tersebut?

Figure 3. Question *Postest*

Before teaching and learning activities are begin, in the initial meeting the researcher conducted a pretest to the control group and the experimental group to define the students' initial abilities. At the second meeting, the experimental group organizes teaching and learning process learning by using the Bruner theory learning model. It begins with students observing the objects in class, any objects that were rectangular, square and triangular. After that the teacher asks the students to do the experiment by conducting experiments to calculate the circumference of a rectangle using a steropom with the same size in the shape of a square, one steropom plot agreed by the student is called a unit square. Students arrange square units into rectangular shapes. The iconic stage, after students have conducted several experiments, the teacher invites students to understand the concept of the rectangle perimeter by inviting students drawing the results of the arrangement of square units and giving identity to the edges of the rectangles (A, B, C and D). Students measure the length of each segment (segments A to B, segments B to C, segments C to D, and segments D to A). After students measure the length of each segment, students add up the measurement results (8 + 4 + 8 + 4). The teacher asks students to simplify the sum so that the equation (2 x 8) + (2 x 4) can be obtained. The symbolic stage, the teacher invites students to give symbols. The symbolized rectangle is K = p + l + p + l or K = 2p + 2l with the statement K = Circumference Square, p = length and l = width.

At the second meeting, after conducting an experiment to calculate the perimeter of a rectangle, the teacher's active phase conducts an experiment to calculate the perimeter of a square using a steropom of the same size in the shape of a square, one steropom plot agreed with the student called a unit square. Students arrange square units into large square shapes. The iconic stage, after students have conducted several experiments, the teacher invites students to understand the concept of the circumference of a square by means of students drawing the results of the arrangement of square units and giving identity to the edges of the square (A, B, C and D). Students measure the length of each segment (segments A to B, segments B to C, segments C to D, and segments D to A). After students measure the length of each segment, students add up the measurement results (5 + 5 + 5 + 5), so it can be concluded that the circumference of a square is four times the length of its sides. The symbolic stage, the teacher invites students to give symbols. The symbolized square is K = s + s + s + s or K = 4 x s with the description K = circumference of the square and s = side length.

At the third meeting, the students conduc an experiment to calculate the circumference using cardboard in various triangular shapes. Enactive stage, the teacher gives a variety of triangular shapes from cardboard. After the teacher shows the various forms of triangles, the iconic stage of the students draws them on a notebook and gives letters at the ends of the triangles (A, B, and C). Students measure the length of each segment (segments A to B, segments B to C, and segments C to A). After students measure the length of each segment, students add up the measurement results (8 + 8 + 5). The symbolic stage, the teacher invites students to give symbols. The symbolized triangle is K = s + s + s with the description K = circumference of the triangle and s = length of the sides. At the end of learning students are given the task of LKK to recall the material that has been learned.

In the control class, teaching learning process is ensured by using conventional learning models. At the beginning of the second meeting, the teacher give a brief learning material about the material around the rectangle and square, then the teacher give the examples of questions and appointed students to answer on the board. Students look active while doing the activity answering questions on the board. The third meeting the teacher presents material about triangles and gives examples of questions and one of the students answers on the board. At the end of learning students are given the task of LKK to recall the material that has been learned.

After giving the treatment to the two groups, in the the fourth meeting, the two group are given a posttest with the same instrument. The results of the research indicate that there are differences in the effect of learning outcomes used as benchmarks for effectiveness indicators on the application of Bruner's learning theory. The results of different analysis of the average pretest and posttets values using the t-test in SPSS version 24 are detailed in Table 1 as follows.

Table 1. T-test Results

Independent Sampel t-test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
hasil belajar matematika	Equal variances assumed	,503	,483	7,989	34	,000	34,00000	4,25572	25,35135	42,64865
	Equal variances not assumed			7,989	27,614	,000	34,00000	4,25572	25,27708	42,72292

Based on the calculation of data analysis using the SPSS program, it is obtained that the average value of the different pretest and posttest values in the experimental class by 13, the difference of the average in the pretest and posttest values in the control class is 12.63889. The results of calculations with the t test formula using SPSS are obtained = 7.989. This result is consulted with T_{table} db = the number of students in the experimental class and the control class (18 + 18) - 2 = 34, at a significance level of 5% and obtained = 0.339. Based on this analysis $T_{aritmethic}$ greater than T_{table} (7.989> 0.339). The results of the relative effectiveness test in the analysis of the data are obtained ER = 50%, these results indicate that Bruner's learning theory in the relatively medium category is around 50% compared to using lecture and assignment methods.

The application of Bruner's theory in the learning process in other words to provide a better influence than those who do not apply the Bruner theory. The findings in this study can be concluded that Bruner's theory influences on mathematics learning outcomes. Bruner's theory is one of the effective theories to improve student learning outcomes, in line with research conducted by Marlinka, et al. (2011) and Azmi, et al. (2020) that the application of Bruner's theory to Mathematics learning subject around the flat shape and the volume of space construction is very influential in improving student learning outcomes. Based on the results of this study and relevant research results, it can be concluded that students understand the circumference of the flat shape by observing real or concrete objects rather than just focusing on the teacher's explanation.

4. CONCLUSION

Based on the results of data analysis from student test results, it could be concluded that :

(1) The average results of the different test of control group students on the subject to calculate the circumference of flat rectangular, square, and triangle shapes using a conventional model was 12,63889.

(2) The average results of the different test for experimental group students on the subject calculating the circumference of rectangular, square and triangular shapes using Bruner's theory model was 13.

(3) From the student learning outcomes (post-test) in the control group and experimental group, there was a difference in the average score of students' final tests of 0.36111 and based on hypothesis testing (t-test) using SPSS obtained T_{count} = 7.989. This result was consulted with T_{table} db = the number of students in the experimental class and the control class (18 + 18) - 2 = 34, at a significance level of 5% and obtained = 0.339. There was a significant influence on the application of Bruner's theory to the learning outcomes of the subject of flat figure construction in fourth grade students of SDN 3 Panderejo Banyuwangi. This could be seen from the results of the calculation of the difference between the pretest and posttest values using t-test in experimental and control group. The results of the t-test calculation were tcount> t table (7.989> 0.339). (4) Learning by applying the Bruner Learning Theory had a moderate effect (obtained by ER = 50%) on the subject of the circumference of a rectangular, square and triangular shape on the learning outcomes of Fourth Grade Students of SDN 3 Panderejo Banyuwangi students.

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