



Comparison of biological learning outcomes, using problem based instruction and two stay two stray model, on the subject of plant structure

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Abstract

Biology is a branch of natural science, the most dynamic. The phenomenon of life in living things, save a lot of interesting problems learned. Problem-based learning makes students centered in learning. Research has been conducted to compare students' learning outcomes by using two stay two stray model and problem based instruction. The method used in this research is quasi-experimental method (quasi-experimental research). From the results of research that has been obtained, it can be concluded that the learning type of problem-based instruction, the kosep structure of plants is very effective for students. This model can train students to be independent and can solve biology especially related to the structure of plants, and train students to look at things in an integrated manner. Model of learning problem based instruction, has a better learning outcomes, compared with the model of learning model two stay two stray.

Keywords: problem based instruction, two stay two stray, plant structure

Introduction

Openness of society is a process that can not be arrested anymore, in line with the current globalization that plagues human life today. The challenges of globalization are so great that they affect the various fields of life not except in the field of education. The flow of globalization brings about a major change in the lives of mankind characterized by the advancement of science and technology, which penetrates the various dimensions of human life. To anticipate these challenges, the world of education in Indonesia, is required to prepare human resources of high quality, broad-minded, have a competitive advantage, and skilled to manage life. In order to realize the society in accordance with the demands of the era, can be started with a strategy in the learning system that is done everyday in the field, beginning from the teacher as a teacher, and students as learners.

Some educational experts say that to prepare a generation that is ready to face the challenges of the times, it is time to develop learning that focuses on training students' thinking (Mulnix, 2012) ^[8]. In the midst of demands for the achievement of ideal education that is able to help students develop their thinking skills, the reality in the field is still very far from ideal. Teaching and learning activities oriented on transferring knowledge from teacher to student, the teacher more role as encyclopedia that does not open creativity room for child. In addition, especially in teaching biology teachers emphasize more students learn and practice (using process skills) to have and master the basic concepts of science, especially biology (mastery learning) (Barrett T 2012; Sumampouw et. al., 2017) ^[12]. But the reality in the field turned out that teachers are still the center of knowledge (teacher centered). This will undoubtedly almost the process

of developing the students' thinking skills, which of course discourages the move to become the product of today's development (Temel, 2004) ^[18].

Based on the observations in SMA Negeri 1 Remboken, obtained some problems encountered especially by biology subject teachers, revealed in the learning activities of teachers have used cooperative learning model but not maximally. Teachers still find difficulties in practicing the learning model, due to the limited knowledge of appropriate learning models for learning biological materials. Teachers re-use classical teaching, which is the process of learning in the classroom that is still dominated by teachers, and students are generally less involved in the learning process. Students only receive information provided by the teacher so that the learning process feels boring, uninteresting and makes students not challenged to learn, ask, express ideas, and impact student learning outcomes are less satisfactory.

According to Sardiman (2001) ^[13], "the role of the teacher as a motivator is very important in order to improve the excitement and development of student learning activities so that teachers should be able to stimulate and give the impetus to mendinamisasikan potential learning siawa". So a teacher should pay attention and look for the right model of learning in the implementation of teaching and learning process. Learning model is considered more is a model of learning that can stimulate students to be more actively involved directly, resulting in a dynamic interaction between teachers and students, the communication process is made possible by the fact that humans are creatures that have a social life. One model that can be used is cooperative learning model.

Cooperative learning model, giving students the freedom to be more active in learning, so the teacher is not the only source of

information for students to learn. In this learning model the teacher only acts as a facilitator for the students. All forms of student activity in learning can contribute or input to the material or concept being studied. Cooperative learning model has several types of learning including Jigsaw, Examples Non Examples, Two Stay Two Stray, Group Infestigation, Think Pair Square, CIRC, Studens Facilitator and Explaining, Make a Match and others.

In the study compared the learning using two stay two stray type and problem based instruction. However, both of these methods emphasize the skills of the students so that they need to be compared. According to Spencer Kagan, quoted by Anita Lie (2004) that, Two Stay Two Stray type cooperative learning model is cooperative learning which gives opportunity to group to share result and information with other group. This type of learning can be used in all subjects and for all ages of learners. Model Problem Based Instruction is a learning model that emphasizes the concept of learning where the concept of material delivered in teaching and learning activities is associated with real situations in student life. So that students experience it themselves not just receive information knowledge mere. Through Problem Based Instruction students are trained to think and reason, because in the implementation students are accustomed to solve a problem, find ideas, ideas, and find something that is beneficial to him.

Research methods

The method that has been used in this research is quasi-experiential research (quasi-exprimental research), because the object is human with the research subject that has been determined its type that is by using problem based instruction model and type two stay two stray on the subject of structure plant. The research variables are learning outcomes (dependent variable) and problem based instruction model and two stay two stray type (independent variable). The research has been conducted in SMA Negeri 1 Remboken class X second semester. The population in this study is all students of class XI SMA Negeri 1 Remboken, consisting of 3 classes with the number of students 120 people. In this study the sample was taken randomly. This study used as many as 2 classes taken from the population.

The research procedure is: a. Into the first glass is inserted a roll of paper as much as 2 pieces containing the writings Xa to Xb; b. Into the second glass is inserted 2 pieces of paper that contains writing cooperative learning model type Problem Based Instruction and cooperative learning model type Two Stay Two Stray. c. Shake the first and second glass together, then remove the roll of paper inside; d. At the first shuffle of the first glass out of class Xa and from the second glass out the cooperative learning model Problem Based Instruction; and e. At the second shuffle from the first glass out Xb and from the second glass out the cooperative learning model type two stay two stray. So in this study class Xa was given cooperative learning model of Problem Based Instruction type; and class Xb were given cooperative learning model

type two stay two stray.

Research design

The research design used is One Shot Case Study. Where the researchers only held a one-time treatment that is estimated to have an influence, then held post test. Research design: Experimental class I: R X11 O1. Experiment class II: R X12 O2. The sample was taken by cluster random sampling (R). Subjects were treated X1 and subsequently measured (O) as a result of the treatment given.

Results

A. Problem based instruction model

Student learning outcomes, the subject of plant structure, is used to analyze statistics. The result of statistical analysis of students taught, using problem-based instruction model, obtained an average value of 19.2. (Table 1). The frequency of student achievement outcomes based on the range of values is shown in table 2.

Table 1: Descriptive statistics of student learning outcomes with problem based instruction mode

Statistics	Value
Minimum	7
Maksimum	25
Rentang	18
Rata-rata	19,2
Varians	392,04
Standar deviasi	19,8

Table 2: The frequency of student learning outcomes with Problem Based Instruction model

Score	Frequency	bk
4 – 7	1	3,5 – 7,5
8 – 11	1	7,5 – 11,5
12 – 15	6	11,5 – 15,5
16 – 19	5	15,5 – 19,5
20 – 23	11	19,5 – 23,5
24 – 27	6	23,5 – 30,5
Jumlah	30	

B. Two stay two stray model

The result of statistical analysis of students taught, using two stay two stray model, obtained an average value of 18.9. (Table 3). The frequency of student achievement outcomes based on the range of values is shown in table 4.

Table 3: Descriptive statistics of student learning outcomes with two stay two stray model

Statistik	Nilai
Minimum	9
Maksimum	27
Rentang	18
Rata-rata	18,9
Varians	388,09
Standar deviasi	19,7

Table 4: Descriptive statistics of student learning outcomes with two stay two stray model

Skor	Frekuensi	Bk
7 – 10	2	6,5 – 10,5
11 – 14	9	10,5 – 14,5
15 – 18	4	14,5 – 18,5
19 – 22	8	18,5 – 22,5
23 – 26	6	22,5 – 26,5
27 – 30	1	26,5 – 30,5
Amounts	30	

According to the purpose of research, to know the difference of student learning result using cooperative learning model of problem based instruction type and using the learning model type two stay two stray on the subject about the concept of plant structure. The data analysis technique used is the difference of two averages for two independent samples. To use the data analysis technique, the requirement that must be met is to know the homogeneity of the two variance (test class).

Homogeneity Test

To find out whether the two test results are homogeneous or not, a homogeneity test of two variance is performed using the Fmaximum test. The hypotheses tested were:

Ho: $\sigma A^2 = \sigma B^2 =$ Both homogeneous variance

H1: $\sigma B^2 \neq \sigma A^2 =$ both variance is not homogeneous

The hypothesis testing rule used in the Fmaximum test is: reject Ho if $F_{count} \geq F_{table}$. The results of the analysis can be seen from the following table:

Table 5: Results of Homogeneity Test

F_{count}	F_{table}	Analysis Results	Decision	Conclusion
1,01	3,15	$F_{count} < F_{table}$	Accept H_o	Both of varians homogen

Description: Complete calculation can be seen in the appendix

Based on the results of the analysis of homogeneity test obtained value $F_{count} = 1.01$, and $F_{table} = 3.15$. So according to the results of the analysis obtained $F_{count} < F_{table}$, so it can be concluded that both groups of data is homogeneous.

Hypothesis testing

Based on the data of student learning test result of both groups come from normal distributed population and second homogeneous variance, then test is continued by using t test. The statistical hypothesis to be tested is: Ho: $\mu A = \mu B$: There is no average difference between the two data sets. H1: $\mu A \neq \mu B$; There is an average difference between the two data sets. The rules of hypothesis testing used are: accept Ho if $-t_{table} < t_{count} < +t_{table}$. The results of the analysis can be seen in the following table:

Table 6: Hypothesis testing results

t_{count}	t_{table}	Analysis Results	Decision	Conclusions
2,33	3,158	T_{count} out of the interval $-t_{count} < t_{table} < +t_{count}$	Tolak Ho	Terdapat perbedaan rata-rata antara dua kelompok

Description: Complete calculation can be seen in the attachment

Thus, the hypothesis that "there is a difference in the results of the second semester students' second semester learning using the problem based instruction model and using the cooperative learning model type two stay two stray on the subject of the concept of plant structure in SMA Negeri 1 Remboken" is accepted. Based on the results of this study, the use of cooperative learning model type problem based instruction and cooperative learning model type two stay two stray provides different learning results. Learning outcomes with cooperative learning model type problem-based instruction values, obtained grade average values higher than the learning outcomes that use cooperative learning model type two stay two stray Thus, cooperative learning model type problem-based instruction has a better learning outcomes, on plant structure material.

Discussion

This research was conducted using the same material that is the concept of plant structure with the time allocation of 5 x 45 minutes or 3 times of meetings, using materials from students' worksheets and authentic materials in the form of discourse taken from newspaper / magazine and direct observation. Students are required to understand the discourse given so they can answer the questions provided in the student worksheet (LKS). At the first meeting in class Xa using cooperative learning model of problem based Instruction type, the learning process is done in the classroom or in other words the teacher explains the theory first about "The Concept of Plant Structure" by using lecture method, question and answer, and assignment to students. At the end of the first meeting the teacher assigns the students the observation of the surrounding plant structure, related to the difference in the monocoty plant structure and the dicoty plant structure. This is done with the aim to observe and solve problems related to the structure of the plants around the school.

Furthermore, at the second meeting, the learning process is done outside the classroom. In this case, students are taken directly to the object / place where there are various species of plants. With the aim of observing the structure of plants at this second meeting is the students can structure the roots, stems and leaves with the model of learning problem based instruction. LKS on this second observation is attached to the RPP. After observing the students presenting their observations, if there are questions from other groups then the questions are discussed together. At the third meeting, the teacher gives an evaluation to the students to get the learning outcomes in accordance with the purpose of learning about the given material. The evaluation tool in this form of objective as

much as 30 items. The research instrument is enclosed in the Lesson Plans (RPP). The results of the evaluation can be seen in the appendix.

At the first meeting in class XIb, using cooperative learning model type two stay two stray, the learning process is done in the classroom or in other words the teacher explains the theory first about "Structure of Plant" by using lecture method, question and answer, and assignment to students. At the end of the first meeting the teacher assigns the students the observation of surrounding plant structures in relation to the structure of dikotile plants and the monocot plant structure, in order to observe and solve problems related to the structure of plants around the school. LKS is attached to the RPP. Furthermore, at the second meeting, the process of teaching and learning remains in the classroom. Students are divided into 4 people in each group then given discourse / photo clippings to work on LKS. After the group discussed the materials and questions given through the LKS, two people from the group became envoys to visit in another group. They will compare with the results of their original group discussion, if there is new information that they get from the group they visit they will take it in their original group to discuss. LKS on the second observation is attached to the RPP. After that, students present their observations and discussions.

At the third meeting, the teacher gives an evaluation to the students to get the learning outcomes in accordance with the purpose of learning about the given material. The evaluation tool in this form of objective as much as 30 items. The research instrument is enclosed in the Lesson Plans (RPP). The results of the evaluation can be seen in appendix 7. In the implementation of teaching and learning activities the teacher arranges in such a way to classify students heterogeneously and combines the level of understanding of students in one group. The grouping is done for both models above.

The problem-based instruction model is better than the cooperative learning model type two stay two stray on the subject of plant structure. This is evidenced from the results of student learning using Problem Based Instruction model obtained the average score (= 19.2) with the highest value of 25 and the lowest value 7, standard deviation (S) = 19.8, while the student learning outcomes are taught using two stay two stray model obtained the average score (= 18,9) with the highest value 27 and the lowest value 9, standard deviation (S) = 19,7. Hypothesis test obtained $t_{hitung} = 2.33$ and $t_{table} = 3.158$. Being outside the boundary area of acceptance, meaning there are differences in student learning outcomes using Problem Based Instruction model and two stay two stray model.

From the learning process of the two models above, it turns out that cooperative learning model of Problem Based Instruction type is better than cooperative learning model type two stay two stray. In the model of problem-based instruction, all students are more skilled because of direct or real observation. In this model, the student centered learning, thus encouraging student inquiry and thinking freely (Sumampouw and Mokusuli, 2017) ^[12]. In addition, problem based instruction (problem based instruction) is based on cognitive psychology. Learning based on this problem the focus of instruction does not emphasize what students are doing

(student behavior) but rather on what they think (cognition) (Corebima *et al.*, 2002; Coombs and Elden, 2004 Amin *et al.* 2017) ^[1, 3, 11]. Therefore the teacher's primary role in this model is to guide and facilitate, so that students can learn, think, and solve problems by themselves.

While the study group of students who use the type two stay two stray students grouped with 4 members to discuss the discourse given by the teacher and understand it within the specified time after that two students from each must visit to other groups to seek information the results of the group discussion. After understanding the results of the group discussions, the two people from each group returned to their original group to explain the information obtained. So that each group can search the red thread of the root of the problem demanded by the question in the student worksheet. However, groups of learners using cooperative learning models type two stay two stray, only master some of the material or the results of discussion from their own group, although in the process of learning they get the results of discussion from other groups. So the results of the discussion is less controlled by some students, especially for students who are difficult to exchange ideas (discuss) with other students. Cooperative learning model type two stay two stray more takes time in learning and membutuhkan better socialization. So that the students in the learning process less chance to individual contribution which ultimately the result of learning is less satisfactory (Lie, 2004; Thomas *et. al.* 2017; Zoller *et.al.*, 2000) ^[9, 17, 19].

Through the model of cooperative learning type Problem Based Instruction students are encouraged to be more active and critical in expressing ideas and opinions. In addition, it also trains students to be more independent in the learning process especially in solving and solving authentic problems that arise around his life. In biology learning, especially the concept of plant structure, it not only focuses on the structure of the plant itself, but also finds and reveals the main causes of problems and possibilities that can have an impact on the diversity of plant structures around the environment. Furthermore, in learning the concept of plant structure using problem-based instruction model of instruction, students are invited to real situation experienced by society, in this case the students brought to agriculture area, to give opportunity of student to see, feel, arise interest to be able to find solution of the problem. The problem raised is the influence of the root structure of plants, on the growth of corn crops. Based on the observations, one of the most determining factors for the growth of corn crops, is the availability of nutrients around the roots.

Conclusion

From the results of research that has been obtained, it can be concluded that the learning type of problem-based instruction, the kosep structure of plants is very effective for students. This model can train students to be independent and can solve biology especially related to the structure of plants, and train students to look at things in an integrated manner. Model of learning problem based instruction, has a better learning outcomes, compared with the model of learning model two stay two stray.

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