



Implementation of the concept map learning model in combined with discovery learning to improve student learning outcomes

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Abstract

The Application of the Concept Map Learning Model is combined with Discovery learning to Improve Student Learning Outcomes. Education as an aspect of improving human resources continues to be improved and renovated from all aspects. It is undeniable that every place that has a number of human pops The Application of the Concept Map Learning Model is combined with Discovery learning to Improve Student Learning Outcomes. Education as an aspect of improving human resources continues to be improved and renovated from all aspects. It is undeniable that every place that has a number of human populations definitely needs education. This is inseparable from the role of education in shaping individual behavior, because education is a vehicle for improving and developing the quality of human resources. The aim of the research is to find out the application of the concept map learning model combined with Discovery Learning can improve student learning outcomes. The method used in this study was a quasi-experiment, using a pre-test n post-test design with a design that is Nonequivalent Control Group Design. The data analysis technique uses the t test where $H_0: \mu_1 \leq \mu_2$ has no effect on learning outcomes between the control class and experiment $H_1: \mu_1 < \mu_2$: There is an effect on learning outcomes between control n experiment classes with a significant level = 0.05. The results of research on the application of concept map learning models combined with discovery learning can improve student learning outcomes. Education definitely needs education. This is inseparable from the role of education in shaping individual behavior, because education is a vehicle for improving and developing the quality of human resources. The aim of the research is to find out the application of the concept map learning model combined with Discovery Learning can improve student learning outcomes. The method used in this study was a quasi-experiment, using a pre-test n post-test design with a design that is Nonequivalent Control Group Design. The data analysis technique uses the t test where $H_0: \mu_1 \leq \mu_2$ has no effect on learning outcomes between the control class and experiment $H_1: \mu_1 < \mu_2$: There is an effect on learning outcomes between control n experiment classes with a significant level = 0.05. The results of research on the application of concept map learning models combined with discovery learning can improve student learning outcomes.

Keywords: concept map, discovery learning and learning outcomes

Introduction

Education as an aspect of improving human resources continues to be improved and renovated from all aspects. It is undeniable that every place that has a number of human populations definitely needs education. This is inseparable from the role of education in shaping individual behavior, because education is a vehicle for improving and developing the quality of human resources. The potential of human resources is a national asset as well as the basic capital of nation building. This potential can only be explored and developed and nurtured effectively through directed and integrated learning, which is managed as a whole and optimally.

But in reality, there have been many efforts made by the government in order to improve the quality of education in Indonesia, but the government's breakthrough has not been fully successful, it even tends to seem only in theory. In fact, if examined, the efforts made by the government were more than sufficient because they were guided by the processes and mechanisms. Not only that, the government is also making efforts to improve the quality of teaching staff or teachers for education.

However, the quality of educators who are still low has become a sharp focus of various parties. Various efforts have been made by the government in realizing the quality of education, ranging from revising to changing the

curriculum, procuring books, educational facilities, management of education in schools, organizing training and increasing the competence of teachers, because the teacher is an element that has an important role in realizing the learning process. quality teaching and learning (PBM) so as to improve the quality of education.

Thus, education, especially schools, must have a learning system that emphasizes dynamic processes based on efforts to improve student learning outcomes. Education must design responsive and student-centered learning so that their learning outcomes continue to improve. But this will not happen if there is no teacher who guides the learning activities.

The teacher is one of the elements in the teaching and learning process. The teacher should be able to provide the same service so that the students who are in charge of the class feel that they are getting the same attention. To provide the same service, of course we need to find the right solution and strategy, so that the expectations that have been formulated in each lesson plan can be achieved.

There are still many teachers using conventional learning methods which tend to be teacher-centered, so as to create a monotonous atmosphere and cause students to feel bored and dislike the subject. One of the efforts made to reduce the monotonous nature that makes students lazy to learn and bored so that student learning outcomes are low, the method

used is by implementing learning strategies with various teaching methods.

The concept of meaningful learning (meaning full learning) initiated by Ausubel in 1963 can be an alternative as a basis for lesson planning. Dahar (1988) explains that meaningful learning is a process of linking new information to relevant concepts contained in a person's cognitive structure. Furthermore, Corebima (2006) [4] explains that any learning strategy used during learning should generally encourage meaningful learning to take place, so that the final results obtained are also meaningful later. Meaningful learning involves assimilating new concepts and connecting them with existing cognitive structures (Erdem *et al*, 2008).

One type of learning strategy that is included in meaningful learning is concept maps. Concept maps are based on the principle of meaningful learning, when learners construct knowledge hierarchies and look for relationships between concepts (Novak & Gowin, 1984, in Tsai *et.al*, 2001). Novak & Canas (2008) [15] defines concept maps as graphical tools for organizing and representing knowledge. Thus, concept maps are a representation of the learner's knowledge structure with an emphasis on the relationships between concepts. Concept maps are a strategy that can help students organize their cognitive structures to become stronger (Kinchin, 2005 in Chiou, 2008). Mc Clure *et al* (1999) explained that concept maps have broad functions, including: 1) learning strategies, 2) learning strategies, 3) curriculum planning strategies and 4) tools for evaluating student mastery.

According to Cassata & French (2006) [3], concept maps can be defined as metacognitive tools that can increase students' reflective thinking about what is already known through the representation of the meaning of concepts and their relationships displayed in visual form. This conception illustrates that concept maps have a close relationship with metacognitive skills. Aside from being a metacognitive tool, concept maps can also be used as an evaluation tool. Another advantage of concept maps is that they can help student retention. Lawson & Hershey (2002) cited in (Chiou, 2008) explains that concept maps can be used as a tool which is a knowledge representation tool that reflects the relationship between concepts contained in students' long-term memory. Furthermore, Yekta & Nasrabadi (2004) explained that concept maps are a very useful instrument to support and help students to improve long-term memory (long time retention) in student memory.

Research methods

1. Research Design

This study uses a Quasi Experiment Design, namely Nonequivalent Control Group Design:

Table 1: Research Design

Class	Sample	Treatment	Post test
Experiment class	R	X	Q2
Control class	R		Q4

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Caption:

R: sample

X: Learning Process

Class Experiment

Control class: no treatment was held

Q2 and Q4: Final test

2. Data Analysis Techniques

1. Validity Test
2. Reliability Test
3. Normality test using the lilifors test
4. Hypothesis Test

This test uses the t test with the testing criteria Reject H0 If the siq value <0.05

Statistical hypothesis

Ho: $\mu_1 \leq \mu_2$ has no effect on learning outcomes between the control and experimental classes

H1: $\mu_1 < \mu_2$: There is an influence on learning outcomes between the control and experimental classes

Results and discussion

Research Data on Student Learning Outcomes Against the Concept Map Model combined with Discovery Learning Experiment Class

The following is the data from the pretest and posttest results for the experimental class:

Table 2: Summary of pretest and posttest data for the experimental class (VIII F)

No	Statistics	Value Statistics	
		Pretest	Posttest
1	Minimum score	30	78
2	Maximum score	50	100
3	Total	930	1992
4	Average	40.4347	86.6086
5	Standard deviation (S)	4.9527	6.1551
6	Variances (S ²)	24.5296	37.8853

Based on the table above, it can be seen that the results of the pretest in the experimental class with a minimum score of 30, a maximum score of 50, a total of 930 with an average of 40.4347 have increased as seen from the posttest score with a minimum score of 78, a maximum score of 100, a total of 1992 with an average 86.6086.

1. Research Data on Student Learning Outcomes Against the Control Class Concept Map

The following is the data from the pretest and posttest control class:

Table 3: Summary of pretest and posttest data for control class (VIII D)

No	Statistics	Statistics value	
		Pretest	Posttest
1	Minimum score	21	60
2	Maximum score	43	80
3	Total	713	859
4	Average	31	37.3478
5	Standard deviation (S)	6.2957	7.5715
6	Variances (S ²)	39.6363	57.3280

Based on the table above, it can be seen that the results of the pretest in the control class with a minimum score of 21, a maximum score of 43, a total of 713 with an average of 31 have increased as seen from the posttest score with a minimum score of 60, a maximum score of 80, a total of 859 with an average of 37, 34.

2. Prerequisite Test Results

a. Normality test

The data taken is a pretest using the Lilliefors test. From the calculations in the attachment with $\alpha = 0.05$, it is obtained:

Table 4: Normality Test Results

No.	Kelas	Kriteria	Kesimpulan
1	Eksperiment	$0.150223 < 0,182$ (H_0 accepted)	Normal distribution
2	Control	$0.097488 < 0,182$ (H_0 accepted)	Normal distribution

Homogeneity Test

After the research pretest data is known to be normally distributed, the next step is to test whether the two data are homogeneous by using the F test with $\alpha = 10\%$.

Experiment class: $S_1^2 = 24.5296$

Control class: $S_2^2 = 39.6363$

Because F count = 1.61 < F table = 2.00 then H_0 is accepted and the two classes are homogeneous.

Hypothesis testing

Because it is known that the data from the two groups are normally distributed and homogeneous, the hypothesis testing can be continued by using the t-test statistic, namely as follows:

The criteria for testing the hypothesis are:

$H_0: \mu_E = \mu_K$

$H_1: \mu_E \neq \mu_K$

From the calculation results, it is obtained that $t_{count} = 3.70$ based on the t distribution table at $\alpha = 0.05$, so $t_{table} = 1.68$ so that $t_{count} (3.70) > t_{table} (1.68)$. Based on the testing criteria, if $t_{count} > t_{table}$, then H_0 is rejected and it means that H_1 is accepted. This means that the application of the concept map learning model combined with discovery learning can improve student learning outcomes.

Discussion of research results

Based on the results of the study, the average value of the experimental class (VIII F) was 40.43 for the pretest and 86.60 for the control class, while for the control class (VIII D) the pretest score was 31 and the posttest score was 68.34, it is clear that there is a significant difference between the learning outcomes of the experimental class and the control class this is because in the experimental class learning is carried out using concept maps combined with the Discovery learning model where students learn through active engagement with concepts and principles. Students are encouraged to be able to think critically and be able to solve problems so that it stimulates them to generate new ideas. Through this method students are also exposed to their own experiences and prior knowledge, to find truths or new knowledge that must be learned.

Thinking at a high level according to Swartz and Perkins in Liliyasi (2001), means aiming to achieve a critical assessment of what we will receive or what we will do with logical reasons, using assessment standards as a result of critical thinking in making decisions, implementing various strategies that are structured and provide reasons for determining and applying these standards, seeking and gathering reliable information to be used as evidence that can support an assessment.

Tyler in Redhana (2003), argues that experience or learning that provides opportunities for students to acquire skills in problem solving can stimulate students' higher-order thinking abilities. Cabrera in Redhana (2003), higher-order thinking is an evaluative activity to produce a. High-level thinking can be used to analyze arguments and generate insights into each meaning and interpretation, developing patterns of reasoning that are cohesive and logical;

understand the assumptions and biases underlying each position; provide a presentation model that can be trusted, concise and convincing. This mindset emphasizes aspects of understanding, analysis, and evaluation (Mulyana, 2009).

Thus, through the study of concept maps combined with discovery learning model discovery learning students can improve student learning outcomes because this model can stimulate students to play an active role in the learning process by answering various questions and discovering basic concepts. Teachers can provide subject matter and invite students to ask questions, see and find answers to the questions themselves.

In contrast to the control class which only uses conventional learning which is usually dominated by the teacher so that students become less active and the problems given cannot be solved immediately. In this learning the lecture method is most often used where students sit and listen and quote and memorize what is conveyed by the teacher according to their respective abilities so that students are not accustomed to performing critical thinking skills in solving problems.

The results of the calculation of the t test analysis obtained $t_{count} (3.70)$ and $t_{table} (1.68)$ so that H_0 is rejected and means H_1 is accepted. This means that the higher order thinking skills of students who use the discovery learning model are higher than the critical thinking skills of students who use conventional learning.

Conclusion

Based on the results of the research that has been done, it can be concluded that the application of the concept map learning model combined with discovery learning can improve student learning outcomes.

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