The Effect of Anchored Instruction Models to Enhance Understanding of Students Related Concept of Vector

Adam Malik[1], Yudi Dirgantara[1] and Nur Muhammad[1]
[1]*Department of Physics Education, UIN Sunan Gunung Djati Bandung, Jl A.H. Nasution No 105 Bandung, Indonesia*

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Abstract: Observation result in MAN 1 Kuningan shows the low understanding of the concept of students. Therefore, there is an effort to improve the understanding of the concept of physics subject on vector concept. This study aims to determine the implementation of learning using the Anchored Instruction model and increased understanding of student' concept on vector concept. The method used in this research is pre experimental design, with the design of one group pretest-posttest. The population of this study was students of class X IPA MAN 1 Kuningan, the sample is selected by random sampling technique that is class X IPA 3 with the number of 28 students. The activities of teacher and students are obtained through the observation sheet, and enhancement of understanding of student concept is obtained from test essay. The results showed the activity of teachers based on the observation sheet with an average percentage of 83% including good category and average of students with the percentage of 74% including the medium category. Increased understanding of students' concepts based on the average normalized gain of 0.71 including in the high category. The hypothesis test was performed using a paired T-test obtained Tcount (25,946) > Ttable (2,052) which means Ho refused and Ha accepted. Thus, Anchored Instruction model can be an alternative in enhancing of understanding of students related concept of a vector.

1 INTRODUCTION

Physics is a subject that provides an opportunity for students to be able to learn the symptoms and events or natural phenomena by discussing, conducting investigations, and working together to determine the concept, principles and trained skills that can enable students to grow independently (Pratama, Sudirman, & Andriani, 2011). Understanding the concept of a cognitive process that can provide interpretation, and able to apply without having to connect with other concepts. Understanding the concept of not just knowing and merely recall the experience as well as producing a concept that never learned, but it is a gradual process. Understand is determining the meaning of instructional messages, Including oral, written, and graphic communication (Krathwohl, 2002).

Students' understanding of the concepts of physics can be enhanced through the implementation of an interactive model of meaningful learning and structured so that the concepts presented are embedded in student-term memory. One form of meaningful learning model that is Anchored Instruction (AI). Model Anchored Instruction has characteristic that allows students actively involved in learning to share their views with fellow students and teachers (Love & Mary, 2004). Model AI also has advantages compared with other models, including students have a meaningful experience to solve a problem, develop students' understanding in a comprehensive manner so as to transfer knowledge in a different context, with the kind of collaborative and cooperative students, and learning to be more effective (Blackhurts, Edward, & Timothy, 1996; Crews, Biswas, Gildman, & Bransford, 1997; Donna, Bird, & Brewer, 2004).

Some of the results of previous studies, the application of the model Anchored Instruction (AI) in learning to enhance the knowledge and abilities of students. Various studies it such as AI can improve mastery of concepts and learning outcomes (Sidik, Ashari, & Maftukhin, 2016), mastery of concepts and problem-solving skills (Hafizah, Hidayat, & Muhardjito, 2014), problem-solving skills (Chen & Howard, 2010; Shyu, 1997; Yulanda, 2014), learning outcomes (Murtijah, Dwijanto, & Sukestiyarno, 2013), mathematical communication skills and self-

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concept (Saputra, 2012). In contrast to previous studies, this research applying AI integrated with laboratory activities to improve understanding of the concept of students on the concept of the vector. Learning the concept of vector rarely implemented through laboratory activities. During this time the teacher explained to students the concept of vector analysis and mathematical methods through lectures and question and answer.

2 METHODS

The method used in this study are pre-experimental design with one-group pretest-posttest. This research was conducted at the experimental class in the without of a control group (Fraenkel H. H. H. Jack R, Wallen, 2012). Type of data collected from this study is qualitative and quantitative data. Qualitative data is data about the activities of teachers and students in all stages of learning with Anchored Instruction models derived from observer comments on the observation sheet. Quantitative data is data improved understanding of the concept of the student after application of Anchored Instruction models using essay test and the percentage of the implementation AI models derived from the observation sheet.

The population used in this study is an entire class X IPA MAN 1 Kuningan 2017/2018 academic year consisting of three classes. Samples were selected using simple random sampling technique. After the draw, the selected class is class X IPA 3 which has a number of students were 28 people.

Stages Anchored Instruction models used in this study consists of five stages: present a complex problem; cooperate with others; solve problems; discuss; and comparative perspective. The average adherence to the activities of teachers and students when applying Anchored Instruction models derived from the percentage of the activities carried out at each stage of the observation sheet. The percentage after Purwanto then categorized according to criteria consisting of: less than once (0% □ 54%); less (55%-59%), sufficient (60%-75%); good (76%-85%); very good (86%-100%) (Purwanto, 2008).

Indicators of conceptual understanding in this study refer to Bloom's revised taxonomy consisting of (1) interpreting; (2) exemplifying; (3) classifying; (4) summarizing; (5) inferring; (6) comparing; (7) explaining (Krathwohl, 2002). Increasing students' understanding of concepts related to the vector between before and after application of AI models calculated using gain normalization (<g>) and interpreted in accordance with the criteria Hake (Hake, 1998). Before the hypothesis test, the normality test and the results showed the data pretest and posttest students' understanding of normal distribution. Hypothesis testing is done using parametric statistics are paired samples t-test to determine the effect of the application of the Anchored Instruction model on students understanding.

3 RESULT AND DISCUSSION

3.1 Result

The average adherence to the activity of teachers at the learning of applying the model of Anchored Instruction in the whole learning based on data on the observation sheet are presented in Table 1.

Based on Table 1 Teacher activity increased at each stage of Anchored Instruction models. The average the highest teacher activity obtained in step cooperate with other that is equal to 85% with both categories. The average teacher activity lowest in comparative perspective stages amounting to 80% in both categories. The average teacher activity at each stage of the application of the overall Anchored Instruction learning showed good category (83%).

Table 1: The average implementation teacher activity at all learning.

No.	Stages of learning model AI	Teacher learning activities on			Ave-rage
		I	II	III	
1	Preliminary	72	80	98	83
2	Present a complex Problem	78	80	93	84
3	Cooperate with other	80	85	90	85
4	Solve problems	75	78	93	82
5	Discuss	70	80	100	83
6	Comparative Perspective	65	80	95	80
7	Close	70	82	93	82
Average		73	81	95	83
Interpretation		Mode-rate	Good	Very good	Good

The average enforceability of student activity at the time of applying the model of AI in the whole meeting based on data on the observation sheet are presented in Table 2.

Table 2: The average enforceability of student activity at all learning.

No.	Stages of learning model AI	Teacher learning activities on			Ave-rage
		I	II	III	
1	Preliminary	62	75	88	75
2	Present a complex Problem	65	80	80	75
3	Cooperate with other	60	80	90	77
4	Solve problems	60	80	80	73
5	Discuss	60	75	80	72
6	Comparative Perspective	60	70	82	71
7	Close	62	77	87	75
Average		73	61	77	84
Interpretation		Mode-Rate	Mode-rate	Good	Good

Activities of students have increased at every stage of the AI model. The average the highest student activity obtained in step cooperate with other that is equal to 77% with both categories. Average of the lowest student activity at the stage of comparative perspective that is equal to 71% with the moderate category. The average of student activity at each stage of the application of the overall AI model meeting showed enough category (74%).

The distribution of scores understanding students' concept can be demonstrated by comparing the average score pretest, posttest and normalized gain <g> students on the vector concept.

Table 3: Score pretest, posttest and normalized gain understanding of the concept of student

	Score		Normalized gain	Inter-pretation
	Pre-Test	Post-test		
Amount	829	2211	0.71	High
Average	30	79		

The improved understanding of the concept of the student has applied to the concept vector AI models included in the high category with an average normalized gain of 0.70, the average value of pretest 30 and posttest average value of 79. Therefore, there is an increased understanding concept of the student after the application of the model AI on the concept vectors.

The improved understanding concept of students included in the low category does not exist. Students who have increased understanding of the medium category were as many as 11 people (39%). The improved understanding concept of students included in the high category there is 17 people (61%).

Data improvement on every indicator in the aspect of students of understanding concept shown in Table 4.

Table 4: The average score of the pretest, posttest and normalized gain <g> for every indicator of understanding concept

No.	Indicator of Under-standing concept	Value		<g>	Inter-pretation
		Pre-test	Post-test		
1	Interpreting	38	85	0.76	High
2	Exempli-fying	30	76	0.65	Mode-ate
3	Classifying	36	80	0.69	Mode rate
4	Summa-rizing	27	80	0.73	High
5	Inferring	26	74	0.65	Mode-rate
6	Comparing	30	90	0.86	High
7	Explaining	24	70	0.60	Mode-rate
Average		30	79	0.71	High

Understanding of the concept of students in each indicator has increased including medium and high categories. Indicators comparing of understanding of the concept is the highest increase with <g> of 0.86. Indicator explaining of students of understanding is the lowest increase with <g> of 0.60. The average normalized gain of the entire indicator of understanding aspects of students categorized as high at 0.71.

Based on the data value calculation Lilliefors pretest is Lcount (0.117) Ltable (0.161) with a 0.05 significance level, indicating that the data is normally distributed pretest. Data posttest known Lcount (0.159) Ltable (0.161) with a 0.05 significance level, posttest data showed normal distribution. Based on the results of hypothesis testing using a paired sample T-test, Tcount = 25.964 values, at the 0.05 significance level the value Ttable = 2.052. From these data indicate that the value of Tcount is greater than the value Ttable. Results of the calculations and the analysis showed that Ho refused and H1 accepted, mean that the effect of applying the model anchored

instruction in improving students' understanding of the concept vector.

3.2 Discussion

Activities of teachers and students in general have been steadily increasing in every meeting after the model applied Anchored Instruction. The highest stages of teacher and student activity occur in stages cooperate with other. Students on stage cooperate with other discussions and collaboration with members of the group to plan and work on the laboratory activity. This is supported by Isman (Isman & Abdullah, 2014) which states students cooperate and discuss with a friend's in the group, to respect the opinion of others, help each other and are more concerned with the interests of the group rather than personal interests, so that the learning process will be meaningful and appropriate plan set previous

Based on the analysis enforceability of the entire meeting, it can be seen that the lowest stage of activities undertaken by teachers and students is the stage of comparative perspective. Students At this stage the students to make conclusions from the discussions with the group presented the results of discussions in class and comment on the results of student discussion. The low stage of comparative perspective, due to several factors such as the student who is not used in making inferences along with his group, the lack of collecting data and information in solving a problem to conclude learning. When in fact, activity in this phase is an important stage because students are expected to explore her abilities in understanding the concepts of physics to solve the problem given by the teacher. Simanjuntak (Simajuntak, 2014) states that students who collect more data and information can improve analytical thinking skills to solve problems, such as representing, comparing, classifying, and concluding.

The indicator comparing have normalized gain value <g> the highest included in the high category. This is because the students already understand when making comparisons across the resultant vector using mathematical and graphic analytical method to solve a problem. This is in line with the results of research conducted by (Yulanda, 2014) that the use of the model anchored instruction affects the students' mathematical problem-solving.

The indicator explaining has normalized gain value <g> the lowest included in the medium category. This is because the students have not been optimal in developing an opinion when describing a phenomenon that in accordance with the concept of physics. In fact, according to Bloom understanding of the concept is the ability to capture notions like being able to disclose a material that is presented in a more understandable form, is able to provide interpretation, and able to apply (Anderson & Krathwohl, 2001). Teachers should continue to train students to understand every concept of the vector and its application in daily life, so the ability to explain the students can be improved (Saputra, 2012).

Overall results showed AI models can affect students' increased understanding on the vector concept. This reinforces previous research AI models give positive results in a potential increase students understand the concepts of the lessons (Chu, Kim, & Cheong, 2011). Additionally, Lie (Lie, 2016) states that the model anchored instruction can improve students' problem-solving. Learning model that is integrated with laboratory activities can improve understanding of concepts, critical thinking skills, creative thinking skills and communication skills of the students (Malik, 2015; Malik et al., 2017; Setiawan, Malik, Suhandi, & Permanasari, 2018).

4 CONCLUSIONS

We have successfully conducted research on the influence of the model Anchored Instruction (AI) on the students' understanding related to the vector concept. The implementation each stage AI models for teacher activity including good categories while student activity including medium category. The understanding of the concept of students categorized high after applied AI models. Therefore, the AI model considered appropriate models to be applied to other physics concepts.

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