

**USING VARIATION TECHNIQUES OF CONCEPT CORRELATION IN THE  
PROBLEM BASED LEARNING MODEL  
TOWARD STUDENTS' ACHIEVEMENT**

**Suciati, Puspita, L; Azizi, A**

*Science Education Magister Program, Sebelas Maret University*

**Abstract**

The purposes of this research was to know the effectiveness of using variation techniques of concept correlation (concept map, mind map, vee diagram, fish bone diagram) in the problem based learning model (PBL) toward students' achievement. This research was used quasy experiment method. The population was the 11<sup>th</sup> grade students of natural science and sample consisted 146 students by using cluster random sampling of 2 different schools (MAN 1 Praya and MAN 1 Surakarta). Cognitive aspect of students' achievement collected by test, affective and psychomotor aspect of students' achievemnt collected by no-test technique. The data were analyzed by anava test.

The results of the research can be concluded that: 1) Concept map technique in the PBL model is most effective toward cognitive aspect of students' achievement (78,30); 2) Fish bone diagram technique in the PBL model is most effective toward affective aspect of students' achievement (90,00); 3) Vee diagram technique in the PBL model is most effective toward psychomotor aspect of students' achievement (77,38).

**Key words:** variation techniques of concept correlation, PBL model, students' achievement

**INTRODUCTION**

Problem-Based Learning (PBL) is one of learning model which suggested its use in Curriculum 2013. The excellence of PBL to improve the students' higher order thinking skills has been showed in many researches. Practically, the use of PBL often rising students' difficulties, especially in finding solutions to solving a problem. Students often have difficulties when they have to make a prediction of phenomena as a problem. The use of various learning techniques based concepts correlation are intended to encourage students to use reasoning in finding problems solutions.

**THEORY**

Carin and Sund (1993) stated that the nature of science (biology) contains three aspects, namely: process (scientific processes), product (scientific knowledge), attitude (scientific attitudes). Scientific processes, it is mean scientific activity to describe natural phenomena to required a product of science includes: facts, principles, laws, or theories. This is relevant to the content of the Curriculum 2013, that learning (biology) delivered by scientific approach that includes 5 components are: observing, asking, reasoning, doing, and communicating. The learning models suggested are: discovery or inquiry learning, problem-based learning, project-based learning (Kemendikbud, 2013). PBL one of learning model which suggested its use with the syntaxs are: problem orientation, organizing of student to learn, helping students in groups

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or individually, work presenting, evaluating the results and the process of problem solving (Arends, 1997). The advantage of PBL has cooperation and interaction in to solve problems, so that students are able to construct their own knowledge, stimulate students to analyze and predict the answer of problem (Wardani, 2012). Making the problem as a basic in the learning process is very important. This allow to create the correlation between content and the context of learning, so that will motivate students in concept understanding (Graaff & Kolmos, 2003)

There are many kinds of learning techniques that emphasize the correlation between concepts with all its characteristics can be presented in learning with the aim to help students understanding the concepts, such as: mind map (MM), concept map (CM), fishbone diagram (FD), vee diagram (VD), roundhouse diagram (RH), etc. First, concept map (CM) is a learning technique that is used to express the meaningful correlation between concepts in the form of proportions, so that causing students construct knowledge more easily. Through the correlation concepts are arranged hierarchically, making learning more meaningful. It is relevant to meaningful learning theory of Ausubel that meaningful learning occurs when students relate their concepts to the cognitive structure by means of assimilating their prior knowledge with the new knowledge (Dahar 2011). Second, fishbone diagram (FD) is a learning technique which emphasizes on causality (cause and effect diagram). Through FD students are encouraged to construct knowledge by analyzing cause and effect of a problem as well as the possible cause of a problem (Dogget, 2005). Third, vee diagram (VD) is a learning technique to make the relationship between thinking and doing. VD has conceptual side (think) and methodological side (work) that interact (Novak & Gowin, 2008). Fourth, mind map (MM) is a learning techniq by making notes that forming a pattern idea interconnected with the main topic in the middle and branches in detail (Buzan, 2007). Maps were created to generate ideas and trigger memories. The use of colors, images, symbols will be better (DePorter, 2007). By considering the advantages of the kinds of learning techniques based concepts corelation, hence its use in problem-based learning model is expected to give a positive impact on students' achievement.

## **RESEARCH METHOD**

This study aims to determine the effectiveness of using various techniques based correlation concepts such as: concept map (CM), mind map (MM), vee diagram (VD), fishbone diagram (FD) on problem-based learning model (PBL) toward students' achievement. This research was used quasy experiment method. The population was the 11<sup>th</sup> grade students of science calss and sample consisted 146 students by using cluster random sampling of 2 different schools (MAN 1 Praya and MAN 1 Surakarta). Cognitive aspect of students' achievement collected by test, affective and psychomotor aspect of students' achievemnt collected by no-test technique. The data were analyzed by anava test. Furthermore, the comparison data of students' achievement both of schools are presented in descriptive qualitative research

## **RESULT AND DISCUSSION**

The data of cognitive aspects of students' achievement in the implementation of PBL models with a various techniques at 2 schools are presented in Table 1.

**Table 1: The Data of Cognitive Aspect of Students' Achievement In The Implementation PBL Model with Various Techniques**

No.	Schools	Student Amount	Model	Various Technique	Students' Achievement of Cognitive Aspect
1.	A	37	PBL	CM	78,30
2.		36		MM	76,69
3.	B	37		VD	77,24
4.		36		FD	71,28
		146			

Keterangan:

A= MAN I Surakarta      B= MAN I Praya

CM = Concept Map      MM= Mind Map      VD= Vee Diagram      FD= Fishbone Diagram

The data in Table I showed that the highest average of cognitive aspect of students' achievement in the implementation of PBL model with CM techniques, while the lowest average of cognitive aspect of the students' achievement in the implementation of PBL model with FD technique. Thus the CM is the most effective technique in the implementation of PBL model toward the cognitive aspect of the students' achievement.

The data of affective aspects of students' achievement in the implementation of PBL model with a various techniques at 2 schools are presented in Table 2.

**Table 2: The Data of Affective Aspect of Students' Achievement In The Implementation PBL Model with Various Techniques**

No.	Schools	Student Amount	Model	Various Techniq	Students' Achievement of Affective Aspect
1.	A	37	PBL	CM	78,0
2.		36		MM	79,70
3.	B	37		VD	87,82
4.		36		FD	90,0

The data in Table 2 showed that the highest average of affective aspect of the students' achievement in the implementation of PBL model with FD technique, while the lowest average of affective aspect of the students' achievement in the implementation of PBL model with CM technique. Thus the FD is the most effective technique in the implementation of PBL model toward the cognitive aspect of the students' achievement.

The data of psychomotor aspects of students' achievement in the implementation of PBL model with a various techniques at 2 schools are presented in Table 3.

Tabel 3: The Data of Psychomotor Aspect of Students' Achievement In The Implementation PBL Model with Various Techniques

No.	Schools	Student Amount	Model	Various Techniq	Students' Achievement of Psychomotor Aspect
1.	A	37	PBL	CM	70,40
2.		36		MM	70,20
3.	B	37		VD	77,38
4.		36		FD	70,72

The data in Table 3 showed that the highest average of affective aspect of the students' achievement in the implementation of PBL model with VD techniques, while the lowest average of affective aspect of the students' achievement in the implementation of PBL model with MM technique. Thus the VD is the most effective technique in the implementation of PBL model toward the cognitive aspect of the students' achievement.

The data of students' achievement (cognitive, psychomotor, affective aspect) in the implementation of PBL model with a various techniques at 2 schools are presented in Table 4.

Tabel 4: The Data Of Students' Achievement (Cognitive, Psychomotor, Affective Aspects) In The Implementation Of PBL Models With A Various Techniques

No.	School	Model	Various Techniq	Cognitive	Affective	Psychomotor	Average
1.	A	PBL	CM	78,30	78,0	70,40	<b>75,56</b>
2.			MM	76,69	79,70	70,20	<b>52,16</b>
3.	B		VD	77,24	87,82	77,38	<b>80,81</b>
4.			FD	71,28	90,0	70,72	<b>77,33</b>

The data in Table 4 showed that the average of students' achievement (cognitive, psychomotor, affective aspect) highest in the implementation of PBL model with a VD technique. The implementation of PBL model with MM technique is the lowest average in students' achievement in. In general, VD technique in the implementation of PBL model most effective toward improving of students' achievement,

## DISCUSSION

The implementation of PBL model with CM technique is the most effective against the cognitive aspect. This is related to the characteristics of were complementary PBL and CM. PBL is the problem-solving based learning model with the syntaxs: problem orientation, organizing of student to learn, helping students in groups or individually, work presenting, evaluating the results and the process of problem solving (Arends, 1997). The advantage of PBL has cooperation and interaction in to solve problems, so that students are able to construct their own knowledge, stimulate students to analyze and predict the answer of problem through making the linking of prior knowledge with new information. PBL models have proved successful in improving the science process skills and students' achievement through problem solving activities (Erick de Graff & Kolmos, A., 2003; Sudarman, 2007; Dwi Putra, 2010; Ghallager, SA & Ghallager, J., 2013).

The existence of CM was assisted students in making the connection between the concepts when they are solving the problem greatly. It is relevant to Ausubel learning theory that learning will be meaningful when students are able to relate the new information with their prior knowledge in their cognitive structure (Dahar, 2011). The effectiveness of the

implementation of PBL models with CM technique has also proven its effective to improve students' achievement (Chin & Gek, 2005; Jonassen & Woei, 2005; Hsu,L, 2004). The implementation of PBL model with FD technique is the most effective against the affective aspect of students' achievement. This is predictable because the problem-solving activities students be able to identify significant factors that have an impact on phenomenon, and the presence of FD technique will be assist students in these activities greatly. It is relevant to Fredendall statement (Dogget, 2005) that through the FD technique students will be trained to brainstorm structurely. The presence of FD will help students categorize the potential causes of a problem fundamentally. In this case the phenomenon is related to environmental issues (pollution). The effectiveness of the use of FD in PBL models are also supported by a wide range of relevant research (Valent, 2012).

The implementation of PBL model with VD technique is the most effective against the psychomotor aspect of students' achievement. It is predicted that syntaxs of PBL loaded with scientific activities that emphasize science process skills. According Novak opinion that the characteristics of VD technique is a method for making the correlation between thinking and doing (Calais, 2009). According Afamasaga (2009) use CM or DV has influenced the development of meaningful learning. Thus the implementation of PBL model with VD technique was helping students to find a link between the relevant concepts and will strengthen students' psychomotor aspect. This is relevant to the Piaget learning theory (Dahar, 2011), he stated when students acquire new knowledge will be associated with their prior knowledge that encourage cognitive conflict. The effectiveness of the use of VD is supported by research results such as: Rooth & Brown (1993).

## **CONCLUSION AND SUGGESTION**

Based on the results of this study concluded that: 1) The use of CM (concept map) technique in the implementation of PBL model to be effective against cognitive aspect of students' achievement (78.30); 2) The use of FD (fishbone diagram) technique in the implementation of PBL model against affective aspect of students' achievement (90,00); 3) The use of VD (vee diagram) to be effective against psychomotor aspect of students' achievement (77.38).

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