

The Effect of Sheet Powerpoint in Mind Map and Entry Behavior Towards Students' Cognitive Competence in Learning Natural Science in Grade VIII of SMPN 5 Bukittinggi

Welli Sriwahyuni¹, Azwir Anhar²

¹Student of Master Degree Program of Biology Educations, State University of Padang

²Lecturer of Biology Department, State University of Padang



Abstract - The result of observation done in grade VIII of SMPN 5 Bukittinggi shows that students' cognitive competence in learning Natural Science (IPA) is still low. An effort to overcome the problem is by using Sheet PowerPoint in Mind Map in learning process. Purpose of the research was to know the effect of Sheet PowerPoint in Mind Map towards students' cognitive competence. It was a quasi experimental research. The population was all of grade VIII students in SMPN 5 Bukittinggi registered in first semester in academic year 2016/2017. The sample was taken by using purposive sampling technique. As a result, VIII 3 was as experimental class and VIII 2 was as control class. The instruments used were multiple-choice test and observation sheets. To test hypotheses, technique of data analysis used was T-test. Based on the finding of data analysis and discussion, it is concluded that cognitive competence of students who learned by using Sheet PowerPoint in Mind Map is better than students who learned without using Sheet PowerPoint in Mind Map.

Keywords - *Effect, Sheet Powerpoint, Mind Map, Cognitive Competence.*

I. INTRODUCTION

Education is expected to be able to produce a qualified output. It can be actualized by doing qualified learning process so that it will produce broad-minded and professional graduates. Quality improvement of learning process needs the use of appropriate learning strategy and media in order to produce effective learning process so that it will produce the qualify graduates. Learning process is a process to transfer knowledge from teacher to students so that teacher needs strategy and media in order that information is transferred well.

SMPN 5 Bukittinggi is an educational institution that seeks to actualize the goals of Indonesia's national education and seeks to produce the qualified output. The vision of SMPN 5 Bukittinggi is competence in academic, extra-curricular, religious, civilized and concerned about environment. SMPN 5 Bukittinggi has Natural Science (IPA) subject which trains various learning experiences to

understand scientific concepts and process. The skill process includes the skills of observing, formulating hypothesis, using tools and materials in good and right way, asking questions, classifying and interpreting data, communicating research finding in oral or written, and exploring and sorting relevant and factual information to test opinion or solve daily problems. The IPA subject is developed through ability of analytic, inductive and deductive thinking to overcome problems related to natural phenomena.

Students' entry behaviors have important role in learning process. Ali (2002: 74) states that basically, entry behavior is a state knowledge that must be owned by students before learning new knowledge or skills. It will influence students' success in learning process. Nowadays, in learning IPA, students receive information from teacher. They are in less motivation environment. They are often trained to use only their left-side brain. Teachers are emphasized more to transfer their knowledge to students in order to finish

learning materials, so that students' creativities and potencies cannot fully actualized. Students' achievement in learning IPA is still low. It is obvious from the score of their second semester examination which shows that there were many students of grade VIII in SMPN 5 Bukittinggi who got score below Minimum Criteria of Mastery Learning (KKM), which is 75. It can be seen in Table 1 below.

Table 1. The Average Score of VII Grade Students' Cognitive Competence in Learning IPA in SMPN 5 Bukittinggi in Second Semester of Academic Year 2015/2016

No	Class	Number of Students	Average Score of Second Semester Test
1	VIII.1	34	70,10
2	VIII.2	36	65,20
3	VIII.3	36	72,10
4	VIII.4	36	67,30
5	VIII.5	34	64,19
6	VIII.6	34	70,65

Source: Vice-Principal of Curriculum of SMPN 5 Bukittinggi

Based on interview with IPA teacher in SMPN 5 Bukittinggi, it shows that students' learning outcome in learning IPA is still low they do not involve actively during learning process in the classroom. It is caused by teacher uses lecturing, group discussion and question-answer methods in the classroom. In the lecturing method, teacher delivers learning materials in one way, in which she transfers her knowledge to students without paying attention to students' background knowledge. In the group discussion method, teacher does not give direction in order to make group discussion goes interactively and interestingly so that it cannot achieve learning objectives.

Another cause is there is not variation of media used by teacher in the classroom. Techer only uses whiteboard and PowerPoint slides in teaching. Consequently, students are not interested and motivated to learn so that learning objectives cannot be achieved maximally. Based on interview done to 10 students of grade VIII in SMPN 5 Bukittinggi on Wednesday, 06 July 2016 about learning media used showed that it needs variation in using learning media in the classroom. The followings are list of questions asked in the interview:

P1 : What learning media was often used by teacher in the classroom during learning process in the previous semester?

A. White board B. PowerPoint

P2 : In your opinion, is learning media used in learning process effctive (easy to understand)?

P3 : Does learning media facilitate you to write the summary of learning materials?

P4 : Do you know another learning media, like Mindmap?

P5 : Is there any teacher in previous semester who used learning media based Mind Map?

For question no. 3, only 40% of respondents answer that it is efective but it is only in learning media of PowerPoint. However, some respondents complain about the content of PowerPoint slides. There are too many words and sentences in the slides so that they need more time to take note even teacher moves to another slide before they finish writing it. In question no. 4, there is about 60% of respondents know about what learning media in form of Mind Map is. Next, for question no. 5, there are 50% of respondents who answer "yes", which is only respondents from class VIII.5 and VIII.6. In addition, the respondents also give information that learning media in form of Mind Map has ever been used by practice teacher in previous semester.

Based on the result of observation above, it can be concluded that there are some phenomena in IPA learning process in SMPN 5 Bukittinggi. The phenomena are (1) there is no variation of learning media used by teacher in teaching, (2) content of PowerPoint slides is overloaded, (3) teacher is less interactive in teaching, in which s/he moves to another PowerPoint slide quickly so that students cannot write the important points in the previous slide. Consequently, they cannot understand the learning materials well. One way to overcome these problems is to use new media for learning. One of them is Mind Map with sheet PowerPoint. Therefore, this research focused on learning media in form of Mind Map, entitled "Effect of sheet PowerPoint in Mind Map and entry behavior towards students' cognitive competence in learning IPA in grade VIII of SMPN 5 Bukittinggi".

II. REVIEW OF RELATED LITERATURE

A. Learning Natural Science (IPA)

In term of physical, Natural Science (IPA) is a science that studies nature and all its contents include earth, human beings, animals, and plants. It is not only a collection of

insight about things or organisms, but also it is more about way of working, thinking and problem-solving. Beside that, it is one theoretical insight that is typically obtained or arranged by doing observation, experimentation, inference, theory formulation, observation and etc, related to one way to another. Meanwhile, according to Permendiknas No. 22 Year 2006 about content standard, IPA is a collection of systematic theories, in which its application is commonly limited on natural phenomena, developed through scientific methods like observation and experiment, and demand scientific attitude like curiosity, open-minded, honest and etc.

Based on the definition above, IPA has four elements. They are (1) product: it is in forms of facts, principles, theories, and laws; (2) process: it is procedure of problem-solving through scientific methods; the scientific methods include observation, hypothesis formulation, experimental designs, experiments or research, hypothesis testing through experimentation; evaluation, measurement, and drawing conclusion; (3) application: it is implementation of method or scientific work and IPA concepts in daily lives; (4) attitude: it is through students' curiosity about objects, natural phenomena, organisms, and causality that can raise new problems but it can be solved by the right procedures. Therefore, IPA is *open ended* because it always develops in line with dynamic changing pattern in society.

B. Learning Media

Generally, media is a tool that is used to facilitate students in learning process. It stimulates their thought, mind, feeling and willingness so that they can learn well. Literally, the word 'media' is a singular form of 'medium', which means deliverer. So, media is the deliverer of a message from a sender to a receiver (Sadiman, 2007:6).

According to Bovee in Ena (2001), media is a tool which functions to deliver a message. Meanwhile, learning is a process of communication between students, teachers, and learning materials. The communication cannot run well without assistance of message delivering tools, which are media. So, learning media is a tools to deliver learning materials or contents.

From the explanation above, it can be concluded that learning media is a tool, material or method/ technique that is used in learning process in order to make interaction and communication between teachers and students become effective and understandable. Something can be considered

as a learning media if it is used to deliver messages in educational purposes.

Nowadays, technology development also affects learning media. One of them is the use of computer as learning media. The use of learning media assisted by computer has significant influence for students' interest to learn the learning materials. It can also save time for learning preparation, increase students' motivation in learning, and reduce students' misunderstanding about teacher's explanations.

C. Mind Map

Mind Map is an alternative thought of brain towards linear thought. It reaches out in all directions and captures the thoughts from all angles. Beside that, it is also a storage and withdrawal data system and an incredible access to a 'large library' in your amazing brain (Buzan: 2009).

Buzan also states that Mind Map is a creative thinking tool which reflects brain's natural way of work. According to Keles (2012), the mind map allows individuals to "organize facts and thoughts" in a map format containing a "central image, main themes radiating from the central image, branches with key images and key words, plus branches forming a connected nodal structure". In addition, the mind map helps students to assimilate new information, to think and to develop their conceptual schema.

Furthermore, Buzan (in Tee, 2014) also guidelines that: "a central focus or graphic representation of the main topic is placed in the center of a page; ideas are allowed to flow freely without judgment; key words are used to represent ideas; one key word is written per line; key words are connected to the central focus with organic lines; color is used to highlight and emphasize ideas; and images, symbols and codes are used to highlight ideas and stimulate the mind to make connections".

So, it can be concluded that Mind Map is a technique to facilitate someone to place information from his brain by writing it creatively and effectively.

D. I Mind Map

I Mind Map is an application released and developed by ThinkBuzan Ltd. It is developed by using Mind Mapping method which is used for brainstorming, organizing, creative-thinking, designing and planning something to do. It can be utilized by using softwares, like Microsoft Windows, Macintosh, Mac OS X dan Linux. These softwares allow to make mind map by using hardwares in

computer, like mouse, keyboard, tablet or interactive whiteboard.

The application can be gotten by downloading or purchasing it. To operate it, there are some steps to do. First, install *Imind Map* application to the computer. Second, set background of mind map document by choosing main picture or color. After setting the background, a red circle (called *BIOS*) will appear. Next, a keyword can be typed in the *BIOS*. After typing the keyword, making of mind map can be started by clicking 'draw' or 'arrow' menu to add lines to connect the circles. Finally, after typing keywords and connecting them, the mind map is obvious and can be changed as desired. In making of mind map using this application, adding pictures, changing font size and selecting colors can be done. This changing is flexible so it can be done whenever the users like to.

This application can be converted to Powerpoint. Beside that, it can also be connected to proyektor to display it for presentation so that the mind map can be explained to other people in a correct order of it.

E. Sheet PowerPoint in Mind Map

In this research, it used Mind Map in form of IMind Map application. This application has a program which can be linked the explanation into PowerPoint slide form. So, learning materials are served in PowerPoint slide and then printed out to a piece of paper (sheet). After that, the sheet is spread out to every students. Beside that, the sheet can also be used to write the important information while learning process is going on.

The *Microsoft PowerPoint* is one of computer program which is integrated into *Microsoft Office*. It is used to arrange presentation. It is beneficial for teachers, students, businessman, employees, etc. According to Asih (2011:1), *PowerPoint* is an application to arrange a presentation. It is very popular and used by many people, like professionals, academics, practitioners and beginners for presentation activities.

F. Students' Entry Behavior

Students' entry behavior is the skills and knowledge that a learner knows or is able to do before beginning to take new instructions. It describes students' readiness in receiving learning materials teacher delivers (Mukhtar, 2003:7). It also shows current students' knowledge and skills level to lead for next level teacher expects in order to be achieved by students. Their ability is not exactly the same

among them. It means that they have their own skills and characteristics. So, teacher should considered the differences among the students in order to make their competence improve.

G. Learning Competence

Lufri (2007: 33) concludes that "learning competence is a description of students' ability or mastery in learning process done by teacher, which includes three aspect: cognitive, affective and psychomotor, that is used to improve quality of the learning process". Moreover, Sa'ud (2008: 90) states that competence can be in form of knowledge, skills and basic values which is reflected in thinking and action behaviors. Further, according to Chappell in Purnamawati (2011: 3), competence is a contested concept so it is created by people who use it.

Arikunto (2007:7) explains that learning competence aims at knowing whether learning materials have been understood by students and whether learning method and/or model used has been appropriate or not. Learning competences are actualized in the change of students' behavior from 'not know' becomes 'know' and from 'not understand' becomes 'understand'. The changes after learning are in forms of attitudes, skills, knowledge and comprehension changes, which include the mastery of cognitive, affective and psychomotor aspects.

III. RESEARCH METHOD

It was a quasi experimental research. In experimental class, learning process used Sheet PowerPoint in Mind Map; while, in control class, it used Mind Map without Sheet PowerPoint. In addition, it used *Posttest Only Control Design*.

The population was all of grade VIII students in SMPN 5 Bukittinggi registered in first semester in academic year 2016/2017. The sample was taken by using purposive sampling technique. As a result, VIII 3 was as experimental class and VIII 2 was as control class. The instruments used were multiple-choice test and observation sheets.

Technique of Data Analysis

Normality and Homogeneity Test

Normality test used was *Kolmogorov-Smirnov* test. Meanwhile, variance homogeneity test used *Levene's* test. Hypothesis testing was also done to know whether there is an effect of using Sheet PowerPoint in Mind Map towards students' cognitive competence.

First Hypothesis Testing

Statistical test used for first hypothesis was T-test because the data were distributed normally and they had homogeneous variance. Criteria of the test are if $t_{count} \leq t_{table}$, so H_0 is accepted and H_1 is rejected. On the contrary, if $t_{count} > t_{table}$, so H_1 is accepted and H_0 is rejected, in which $dk = n_1 + n_2 - 2$.

IV. FINDINGS AND DISCUSSION

A. FINDINGS

1. Description of Cognitive Competence Data

In this research, data of students' cognitive competence were obtained through final test. It was a written test in form of multiple choice test administered to students in both experimental and control classes. It was administered at the final meeting of each basic competence. From the result of the test, it is known that the average score of students' cognitive competence in learning IPA in experimental class is 81.43, while, the average score of students' cognitive competence in learning IPA in control class is 72.24. It means that the average score of students' cognitive competence in learning IPA in experimental class is higher than in control class. Beside that, the maximum and minimum scores of students' cognitive competence in learning IPA in experimental class are also higher than in control class.

2. Testing of Analysis Requirements

Testing of analysis requirements is done before doing Hypothesis testing. The tests are normality test by using *Kolmogorov-Smirnov* test and homogeneity test by using *Levene* test with assistance of SPSS software. If data is distributed normally and homogeneously, the hypothesis testing uses T-test. On the other hand, if data is not distributed normally, variance homogeneity test is done and hypothesis testing uses *Mann Whitney U* test.

a. Normality Test

Normality test was done to students' test scores of Basic Competence (KD) 1 and Basic Competence (KD) 2 in both experimental and control classes. It is done by using *Kolmogorov-Smirnov* test with assistance of SPSS software. The testing criteria are H_0 is accepted if sig. value > 0.05 , and H_0 is rejected if sig. value < 0.05 .

b. Hypotheses Testing

First Hypothesis

Hypothesis testing is used to know whether the cognitive competence of students who learned by using Mind Map with sheet PowerPoint is better than the cognitive competence of students who learned by using Mind Map without sheet PowerPoint. It used T-test because the data were distributed normally and they had homogeneous variance. Result of the hypothesis testing can be seen in Table 2 below.

Table 2. The Result of First Hypothesis Testing

Class	Sig	A	Conclusion
Experimental	0,002	0,05	H_1 is accepted
Control			H_0 is rejected

Result of calculation in Table 2 shows that students' cognitive competence has Sig. value < 0.05 , which means H_0 is rejected. It means that the scores of students' cognitive competence in experimental class have significant difference from control class. Therefore, it can be concluded that the cognitive competence of students who learned by using Mind Map with sheet PowerPoint is better than the cognitive competence of students who learned by using Mind Map without sheet PowerPoint.

B. DISCUSSION

Research finding shows that students' cognitive competence can improve by using sheet PowerPoint in Mind Map. Based on data description explain previously, it is obvious that the average score of students in experimental class who have learned by using sheet PowerPoint in Mind Map is significantly better than the average score of students in control class who have learned by using Mind Map without sheet PowerPoint. It is caused by the treatment given to experimental class, which is learning by using sheet PowerPoint in Mind Map. Beside that, Mind Map also becomes a tool for students to develop their critical thinking skill assisted with the use of sheet PowerPoint in learning process. So, they can write summaries of learning materials and understand them easily.

Sugiarto (2004:75) states that Mind Map is a good learning method to be implemented by teacher to improve students' memorization and conceptual understanding. In addition, students can improve their creativity through freedom of imagination. Sugiarto (2004: 76) also gives further explanation that Mind Map is a creative exploration done by someone about a whole concept through explaining sub-topics and ideas related to it in a piece of paper by describing symbols, words, lines and arrows.

In this research, learning media based Mind Map was implemented to grade VIII students in SMPN 5 Bukittinggi in integrated IPA subject. Implementation of the media uses scientific approach with problem based learning model which is appropriate with 2013 curriculum. According to Erda (2018), problem based learning model is a learning model which demands students to be active in learning process. Furthermore, Abanikannda (2016) also says that by using problem based learning model, it can facilitate students to have experiences in collecting, managing and keeping information to be used in future and overcome the complex and real problems in learning process.

Beside that, recitation method is also implemented in learning process, in which students are required to take notes based on explanations from teacher and from material print out given to every students in form of sheet PowerPoint. The sheet PowerPoint given before learning process begins is in form of Mind Map and PowerPoint slides. It is also attached with some empty lines which can be used by students to take note about the important explanation of the learning materials by using their own language.

According to Anggriawan (2018), cognitive competence is the mastery of a learning material or students' understanding about a certain learning material. Therefore, learning materials which are chosen are structures and functions of plants' tissues and digestive system. These learning materials are chosen because they serve more theories and pictures. Therefore, Mind Map model in this research is suitable to be developed by using *IMind Map* application program because it can visualize overall theories into some branches as sub-titles of the main material and it can be added with iconic pictures to make it easy to remember.

In presenting the Mind Map, providing link is suggested if there is a long explanation of a sub-title of materials being explained. This Mind Map is developed in computer based. The implementation of this media needs infocus and computer to operate it. Generally, students often use it in learning process in the classroom or in the laboratory.

Students in experimental class can write their own notes by seeing pictures and explanation existed in their sheet PowerPoint so that it can help them to think fast and make them active to find something related to the learning materials they are studying. Therefore, students are assisted to learn from visualized sheet PowerPoint in Mind Map. It is in line with Athanassiou (2003), who states that learning is

“a search for meaning by the learner, in which constructing knowledge rather than passively receiving it, shaping as well as being shaped by experiences”.

Pictures is a media to stimulate ideas, opinions or thought. The idea will encourage students to do and follow mindset as the picture or make a new one. It can be seen from activity in completing sheet PowerPoint, in which students can do it actively to find material explanation by using their own language. By giving semantic tasks by using pictures, it can activate brain cells which relate neuron in brain especially in left-side brain. It means that giving visual stimuli in sheet PowerPoint can help them to stimulate their brain to think fast.

It is in line with Garlough (2013), who says that the magic of mind mapping is that it a whole brain alternative to linear thinking. This ingenious tool engages both sides of the brain with the use of image, color, and imagination (right brain activates) in combination with words, numbers, and logic (left brain activities). It encourages synergetic thinking. The sum of the ideas coming from utilizing the whole brain is greater than the sum of its parts.

The sheet PowerPoint is used to optimize students' involvement and activeness in learning process. The giving of the sheet can guide students to do activities related to learning in order that they can understand learning materials easily.

The sheet PowerPoint used in experimental class is arranged according to the order of learning materials with colorful and illustrative display and giving short explanation of learning materials so it attract students' attention. By the existence of *sheet PowerPoint* in Mind Map, it can make learning process better and more meaningful. Beside the function of media, it can help students to be more focused and lead their thought in learning process so that it can create independent learning and reduce the opportunity for students to play during learning. According to Koksall (2012), self-regulation learning of advanced science students is predicted by two epistemological beliefs, which are the beliefs regarding the dependence of learning on struggle and inborn characteristics, such as intelligence and competence.

From learning process in experimental class, it shows that students are active because they are given chance to write summary of learning materials in *sheet PowerPoint*. They understand the materials through *sheet PowerPoint* because they have experiences in discovery process.

Obtaining something by using this way will be remembered in longer time. Furthermore, students who get knowledge by using Mind Map with *sheet PowerPoint* will be able to transfer their knowledge to various contexts. Overall, learning through implementing this model can improve students' reasoning and ability to think freely, and train their cognitive competence to find learning concepts/ principles by themselves.

Students' cognitive competence in control class is lower than students' cognitive competence in experimental class because it only used Mind Map without sheet PowerPoint and entry behaviors. Variety of students' ability will affect the mastery of learning material taught by teacher in the classroom (Ennike, 2017:180). It is obvious from students' test result, in which they are difficult to remember the learning materials because teacher did not give them sheet PowerPoint as summary of the learning materials. It is in line with Berglund (2015) who states that purpose of Mind Map is to set mind and brainstorm it. In addition, it can be considered as visual form of taking notes. Beside that, it also aims at assimilating new and meaningful knowledge and emphasizing the knowledge relational structures.

Students need more time to understand learning materials given by teacher. They need to open their books because there is no learning media which support them to understand learning materials so that their involvement and activeness in the classroom cannot be optimized. Consequently, they become lazy to read the materials and write summary of it on their notebook.

Not being motivated in learning in the classroom affects students' ability to understand the concept of learning materials they are studying. As a result, students' cognitive competence will be low. It is proved when teacher asked one group to present their report in front of the class, they were not ready yet so that teacher asked another group. To solve the problem, teacher limited time of Mind Map display. After that, they were asked to read the material and write its summary on their notebook.

Based on the explanation above, learning process in both sample classes, experimental class and control class, has significant difference. In experimental class, learning process which used sheet PowerPoint in Mind Map has better average score of cognitive competence than average score of cognitive competence in control class which used Mind Map without sheet PowerPoint. It is in line with Mani (in Tee et al., 2014), which states that adopting Mind Map can significantly improve students' achievement.

V. CONCLUSION

Based on the research finding and data analysis, it can be concluded that there is an effect of using sheet PowerPoint in MindMap towards students' cognitive competence.

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