THE EFFECTIVITY OF INTERACTIVE MULTIMEDIA AS LEARNING MEDIA TO REDUCE STUDENT'S MISCONCEPTION ON HUMAN CIRCULATORY SYSTEM

Letti Nainggolan[*]**, Herbert Sipahutar**

Department of Biology, Faculty of Mathematics and Natural Science,

State University of Medan

[*]Email : lettienainggolan@gmail.com

Abstract

　　　　This study was aimed to analyze the student's misconception on human circulatory system topic and also to determine the effectivity of interactive multimedia to reduce students misconception that experienced by students of XII IPA grade in SMA Negeri 1 Berastagi. The study consisted of two parts. Firstly is descriptive to investigate student's misconception on human circulatory system topic. Secondly quasi experimental research used after learning process. Quasi experimental research used to determine the effectivity of interactive multimedia in reducing student's misconception. The experimental used one group pretest and posttest design. Instrument that used for detecting students misconception were two dimensional diagnostic test and essay test, for reducing students misconception by using interactive multimedia as learning media. Student's misconception reduce 42.46% in group that using interactive multimedia as learning media and reduce 14.8% in group without interactive multimedia. Based on the calculation, it was got 0.57 as gain index value in group that using interactive multimedia and 0.30 as gain index value in group without interactive multimedia. The t-test result was t_{count} (6.598) and t_{table} (1.699), so t_{count} (6.598) > t_{table} (1.699). It was conclude that interactive multimedia is effective to reduce student's misconception on human circulatory system in SMA Negeri 1 Berastagi Class XII IPA A.Y. 2016/2017.

Keywords: Misconception, Students' Misconception, Human Circulatory System

INTRODUCTION

　　　　In the learning activity often found various obstacles that make teaching and learning activities become disrupted. One of the obstacles is the concepts presented by the teacher that cannot be well accepted by learners causing misconception on students. Therefore, it is very important for teachers to identify misconceptions and the cause that occur in students when they inaccurate to capture the concept (Suparno, 2013). The misconception may basic concept form, errors relationships between wrong concepts, ideas or view. Novak (Suparno, 2005) states that the misconception is an interpretation of the concepts in a statement that cannot be accepted.

　　　　Factors that cause misconception among others are the students themselves, textbook, context, teacher and learning methods used by teachers in the classroom (Tekkaya, 2002). But the most dominant factor that led to the occurrence of misconceptions caused by the students themselves because someone naturally has the process of forming his own understanding.

　　　　Misconceptions cause students difficulties to receive materials, especially biology. Biology is study that easy to understand when using appropriate instructional media, because for some students it is difficult to understand the abstract biological concepts without media. Abstract concept is quite difficult and this may be cause misconception in students. Some of the concepts of biology that relatively difficult and has misconception are circulation, respiration, ecology, photosynthesis, genetics, classification, internal organs, organ systems and processes of the human body.

　　　　Some studies indicate that the material circulatory system is a matter of abstract and difficult to understand so as to provide opportunities for misconceptions (Simarmata, 2016). Misconceptions that often occur in the circulatory system that is the subject of blood vessels. The concept of human blood transportation is important in learning biology because it is the key process of life and the basis of the overall functioning of the organism (Peleaz, 2005).

There are some misconceptions about the circulatory system. According to research Peleaz (2005) shows the students' perceptions about one heart function that produces blood while the function of the big circulatory system that clean the blood in the heart and to produce energy. The statement is actually misconceptions and the concept is the heart works to pump blood entering the blood, while production occurs in the bone marrow. The true concept of big circulatory system function are carrying blood throughout the body and also carry impure blood back to the heart (Champbell, 2000). Arnaudin and Mintzes (1985) reported that high school students experiencing misconceptions about the veins are blood vessels in the blood that is blue, but the true concept is deoxygenated blood.

Based on the research conducted when observation in SMA Negeri 1 Berastagi show that certainly misconceptions happen to the students about human circulatory system material. The data obtained from the researchers interviews with teacher and some students. Ginting (2015) said that more than 50% students in SMAN 1 Berastagi got low learning outcomes on circulatory system concept. The low of learning outcomes for allegedly abstract sub concepts as organs making up the circulatory system in humans, heart functions, blood vessels, blood in the circulatory system and disorder related common in human circulatory system. Teacher also said that the material of the human circulatory system is also a difficult material to understand by the students thus allowing the occurrence misconceptions. So, if there is a misunderstanding or misconception on the material circulatory system will affect the next material.

One effort to reduce the student's difficulties in understanding the concept that led to misconceptions is using a learning media such as interactive multimedia. The using of interactive multimedia is one of the alternative ways that can be selected by the teacher to present abstract biological concepts. In addition Teoh (2007) also states that the interactive multimedia as a learning media can support the transfer of knowledge. Thus, the using of interactive multimedia expected to deepen the understanding of the concept and to decrease the happened misconceptions. To reduce

the misconceptions by using interactive multimedia according to research conducted by Fitria (2013) indicate that the using of interactive multimedia can reduce the misconceptions of students on buffer solution subject matter.

RESEARCH METHODOLOGY

The research types in this research were descriptive research and quasi experiment research type design. First, descriptive research was used to investigate students based on the mastery and misconception about Human Circulatory System. Second, quasi experiment research implemented after know the existence the number of students misconceptions. Quasi experiment research implemented to know the effectivity of interactive multimedia as learning media to reduce student's misconceptions level.

This research was conducted on July to August 2016 in SMA Negeri 1 Berastagi at Jamin Ginting Street No.12 Berastagi. The sample was drawn simple cluster random sampling. Selected XII IPA 6 as much 32 students as control group and XII IPA 2 as much 30 students as experiment group.

The instrument used in this research was multiple choices with CRI (*Certainty Response Index*) and essay. The instruments developed become multiple choices question as 20 question and confidence level that is CRI (*Certainty Response Index*) in the answer sheet. The instrument developed by researcher namely to make the multiple choices question and answer sheet as number of students which in the answer sheet has five confidence level choices that should selected one by students according to their ability when answer the question. Then, the essay test had 13 questions from each material concept as 13 concepts too of human circulatory system topic. One question indicates one concept of human circulatory system topic. So, the total of the question is 33 questions.

The instrument must be arranged in advance based on the competence standards of curriculum 13 and adapted to the learning objectives that have been set in a lesson plan as validity content and coverall the material concept on human circulatory system until 20 questions in multiple choices with CRI and 13 questions in essay test.

Then construct validity was the implementation to get consulted on the validity from competent lecturers as their field. The research design consist of three stages, namely :

Preparation Stage

Made research instrument test is equipped with multiple choice with CRI value and essays test

Implementation Stage

Gave the pretest to identify the initial student's misconception in both classes. The misconception result of student's adjusted with sub material concept. Taught the students in control class using lecturing method without interactive multimedia but in experiment class using interactive multimedia. Gave posttest for students in the last meeting to get the last student's misconception on human circulatory system with same question in pretest.

Analysis Stage

Result test of multiple choices with CRI level confidence and essay test should analyzed to get the percentage of students don't know concept, know concept and misconception based on wrong and right answer of students (Table 1).

Table 1. Students Answer Criteria with
CRI Confidence Level (Hasan,1999)

Answer Criteria	Low CRI (< 2.5)	High CRI (> 2.5)
Correct Answer	Don't know concept	Mastery (know) concept
Wrong Answer	Don't know concept	Misconception

Data analysis technique determines percent of student's misconception test, to know the percentage of student's misconception or students understanding.

To analysis technique for essay test with checks the students answer in each question. Based on the students answer can determine the concepts of student's misconception. If the answer is right means students understand or know the concept. While the student's answer is wrong means student has misconception. And if student do not answer the questions means that students don't know the concept.

Analysis of the increase students' cognitive is used to determine whether the increase cognitive

learning outcome of students in the experimental class is higher than the control class. Increasing cognitive achievement of students is determined by calculating the normalized gain. Here is the formula normalized gain by Meltzer (2002).

$$<g> = \frac{posttest\ score - pretest\ score}{maximum\ score - pretest\ score}$$

The calculations results will interpreted using the gain index $<g>$ classification (Table 2).

Tabel 2. Gain Index (Meltzer, 2002)

Gain criteria	Interpretation
g > 0,70	High
0,30 < g ≤ 0,70	Medium
g ≤ 0,30	Low

Interactive multimedia as learning media is effectivity to reduce the level misconceptions on students if the value $<g>$ in the experimental class is higher than the value $<g>$ in the control class.

RESULT AND DISCUSSION

There was misconception on students in SMA N 1 Berastagi. The misconception reduced on multiple choice tests in control class as much 4.34%. The misconceptions in control group as much 25.26%. The misconceptions reduce in some sub material concept for control group. Increasing misconception occurred in sub material concept 4 (Heart). The highest misconception occurred in blood clotting and disorders that able occur in human circulatory system sub material concept for control group (Figure 1).
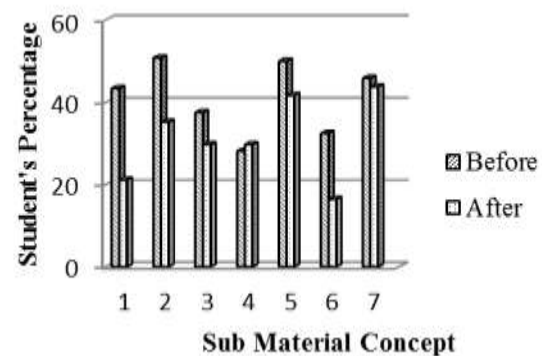

Figure 1. Presentation student's misconception of before and after treatment based on material concept in control group (1.Blood and its Components; 2.Blood Clotting; 3.Blood Groups;

4.Heart; 5.Blood Vessel; 6.Blood Circulatory System; 7.Disorder that able occur in human circulatory system)

. The misconception reduced on multiple choice tests in experiment group as much 22.05%, while reduced on essay test in experiment group as much 62.87%. In experiment group, the highest misconception occurred in blood vessel and disorders that able occur in human circulatory system sub material concept (Figure 2).
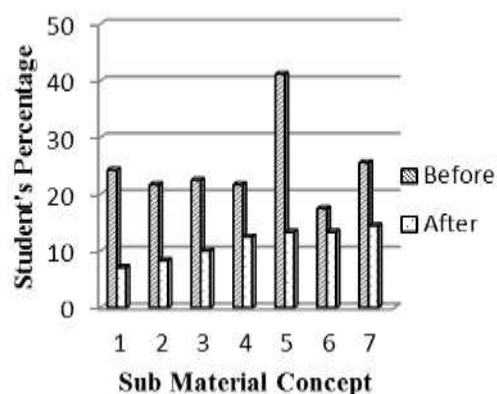

Figure 2. Presentation student's misconception of before and after treatment based on material concept in experiment group (1.Blood and its Components; 2.Blood Clotting; 3.Blood Groups; 4.Heart; 5.Blood Vessel; 6.Blood Circulatory System; 7.Disorder that able occur in human circulatory system)

Analyzed the data based on score total of students in pretest and posttest test. It calculated with gain test to prove that the student's cognitive level is increase (Table 3).

Table 3. Gain Test Result

Test	Group	Gain Index Value	Improvement Criteria
Multiple Choice	Control Class	0.27	Low
	Experiment Class	0.41	Medium
Essay	Control Class	0.34	Medium
	Experiment Class	0.73	High

Based on Table 3. shown that improvement cognitive level of students in experiment group higher than students in control group. In multiple choices test, gain index value from control group is 0.27 with low criteria, the gain index value from experiment group is 0.41 with medium criteria. The gain index value in essay test from control group is 0.34 with medium criteria and from experiment group is 0.73 which criteria is high. From the result, prove that gain index value in experiment group higher than in control group which means that interactive multimedia as learning media is effectivity to reduce misconception level in students.

Misconceptions on each concept covered in material of the human circulatory system for the experimental class is always smaller than the control class. Fariza (2011) in the study concluded that: (1) Learning remediation using computer animation media can reduce the number of students who have misconceptions as indicated by changes in the number of students not misconceptions on some concepts (2). After learning at remediation using animation media changes the distribution of students who have the misconception that a small portion of the students change an answer, but still remains on the statement and the other misconceptions selecting answer choices in the category do not understand.

The research result of two dimension diagnostic test and essay conclude that interactive multimedia as learning media effectivity to reduce misconception on students and able to increase the know concept of students, that is shown from the gain value of experiment group higher than control group. The increasing of student learning outcomes experimental group is better than the control group because interactive multimedia display attractive make students more motivated and concentrate on the course. This can be seen from the student's answer during test with increased the level confidence and known more the answer when filled answer sheet.

Finally, to conclude if the effectivity of interactive multimedia as learning media to reduce students misconception, hypothesis testing was done. Based on calculation, it was got t_{count} (6.598) and t_{table} (1.699), so t_{count} (6.598) > t_{table} (1.699). It was conclude that interactive multimedia is effectivity to reduce student's misconception on

human circulatory system in SMA Negeri 1 Berastagi

CONCLUSION

From the result and discussion conclude that the highest reduction of misconception is in experiment group which using interactive multimedia. It was proved from gain test result which the value in experiment group higher than in control group mean that cognitive level in experiment class higher than control class.

REFERENCES

Arnaudin, M. W. and Mintzes, J. J. (1985). Students' alternative conception of the human circulatory system: Across age study. *Science Education*, 69 : 721 – 733.

Campbell. (2000). *Biologi Edisi 3*. Erlangga Publisher. Jakarta.

Campbell, N. A., Jane, B. R., & Lawrence, G. M. (2004). *Biologi Edisi Kelima Jilid 3*. Jakarta: Erlangga.

Fariza. (2011). *Pembelajaran Remidiasi dengan Menggunaka Media Animasi Komputer Terhadap Penurunan Miskonsepsi*. Surakarta.

Fitria. (2013). *Efektivitas Penggunaan Multimedia Interaktif dalam Upaya Meminimalisasi Miskonsepsi Siswa pada Materi Pokok Larutan Penyangga*. Skripsi. FMIPA. Semarang, Indonesia: UNNES Press.

Hasan, Saleem., Bagayoko D. and Kelley E. L. (1999). *Misconceptions and the Certainty of Response Index (CRI). Journal of Physics Education*, 34 : 294-299.

Meltzer, D. E. (2002). The Relationship Between Mathematics Preparation an Conceptual Learning Gain in Physics: A Possible "Hidden Variable in Diagnostic Pretest Scores". *American Journal Physics,* 70(12): 1259–1268. (Accessed on April 10th, 2016).

Peleaz, N. J., Denise, B., Rojas, J.B. and Hoover, M. (2005). Prevalence of blood circulation misconception among prospective elementary teachers. Adv Physical Educ. 29:172-181

Suparno, Paul. (1997). *Filsafat Konstruktivisme dalam Pendidikan*. Yogyakarta: Kanisius.

A.Y 2016/2017.

Suparno, Paul. (2005). *Miskonsepsi dan Perubahan Konsep Pendidikan Fisika*. Jakarta: Grasindo.

Suparno, Paul. 2013. *Miskonsepsi & Perubahan Konsep dalam Pendidikan Fisika*. Jakarta: Grasindo

Tekayya, C. (2002). Misconception as Barrier to Understanding Biology. *Journal of Hacettepe University Education Faculty*, 23 : 259-266.

Teoh, B.S.P and Neo, T.K. (2007). Interactive Multimedia Learning: Students' Attitudes and Learning Impact in an Animation Course. *The Turkish Online Journal of Educational Technology – TOJET,* 6(4): 1303-6521. Found in: http://www.tojet.net/articles/v6i4/643.pdf (Accessed on April 10th, 2016).