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The Effectiveness of Interactive Media Simayang Model to Increase The Skill of Science Process

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ABSTRACT

This study aims to determine the effectiveness of the use of interactive media on SiMaYang learning model in improving the skill of the science process. The research method used is quasi experiment with pretest-posttest design. The sample selection is conducted randomly from the population of the students of grade VIII SMPN 1 Sukoharjo Pringsewu in the academic year 2016-2017, so that the class VIII A is obtained as experimental class and VIII B as the control class. Quantitative data are pretest, postest, and n-Gain results. Qualitative data is in the form of observation result of learning implementation. The results show that the use of interactive media of SiMaYang model is effective to improve students' science process skill. This is shown by the high n-Gain in the experimental class that is 0.71. The implementation of learning is also very high.

Keywords: Interactive media, SiMaYang, skills of science process

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INTRODUCTION

Science is one of the disciplines where it examines three aspects, namely science as a product, process, and scientific attitude. Science as a product is a body of knowledge that includes concepts, principles, laws, and theories (Duschl, 2007). Science as a process plays a role in acquiring and developing knowledge through the skills of science process. Scientific concepts of science which are abstract can be incarnated in the form of concrete as technology. In other words, technology can be interpreted as an effort to apply the concept of a useful science (Duschl, 1990: 8-11). The development of science and technology is closely related to the development of science. Without the development of science technology, the science cannot make progress, and vice versa (Santiasih, 2013).

The rapid development of science and technology requires people to provide qualified human resources (HR) that can be realized through education. Various efforts made by the government to improve the quality of education including science seem to have not shown optimal results. This is reflected in the results of the 2015 PISA (*Program for International Student Assessment*) study, of which 40 out of 70 countries have an average science achievement score below the international average of 493 (OECD, 2015). The results of TIMSS (*The Trends in International Mathematics and Science Study*) show that Indonesia is ranked 40th out of 42 countries with an average rating of 406 (IEA, 2012).

The low quality of science education also appears in schools in Lampung province. Based on the results of preliminary study observation and interviews on some junior high school teachers in Lampung Province, it is identified that in the use of interactive media

66.66% have never used interactive media and 58.33% do not understand about interactive media on science learning as learning resources. 75% of teachers have not implemented the learning model. The learning process which is still conventional is 83.33% and has not led the students to do a strategy that can develop students' science process skills.

Scientific process skills in learning are done by accommodating the implementation of scientific activities. Karamustafaoglu (2011) states that the skills of the science process will not develop in students when the learning process does not accommodate the occurrence of scientific activities that can trigger the growth of scientific attitudes and hone skills in students. In line with that May et al., (2007) state that through science learning students do not only develop science process skills but they gain their own learning experience. Indicators of this science process skill include the skills of observing, classifying, predicting, interpreting, and communicating (Tawil & Liliasari, 2014: 37-38).

The implementation of education in accordance with the future needs will only be realized if there is a shift or change in mindset in the learning process such as the change from teacher center to student center. The learning must be *Student centered learning* and able to develop the potential of the learners;the learning from one direction to the interactive, from the virtual / abstract to the real world context, and from the single tool to the multimedia tool (Ministry of Education and Culture, 2013: 5).

The acquisition of knowledge and skills, changes in attitudes and behaviors can occur because of the interaction of communication through learning media. Media can help in the learning process such as using interactive media by displaying the subject matter in the form of video, images, animation, so that the concepts that are abstract are more easily understood (Suartama, 2010). Interactive media are potentially powerful in increasing the effectiveness and efficiency of learning (Siagian, et al., 2014). It is supported by Ferguson's research result, et al. (2015) which states that interactive multimedia is able to illustrate concepts to achieve specific learning objectives.

The achievement of learning objectives is highly dependent on the students' active interaction to learn abstract science concepts through the interconnection of macro, micro, and symbolic science phenomena, so as to assist students in optimizing the science process skills. One of the learning models that is oriented towards increasing student involvement is SiMaYang learning model. The result of Sunyono, et.al (2015) study is that learning with multiple representations is more effective in building students' mental models in understanding the concept of atomic structure than conventional learning.

Based on the above explanation the purpose of this study is to know the effectiveness of the use of interactive media on learning model of SiMaYang on the material of human excretion system which is expected to improve students' science process skills.

MATERIAL AND METHODS

The research method used is research and development method. The research steps undertaken are adopted from Borg & Gall (2003). Research and Development is a research

method used to produce a particular product and to test the effectiveness of the product (Sugiyono, 2014). The research is conducted in SMPN 1 Sukoharjo, Pringsewu Lampung in the academic year 2016-2017 with the students of class VIII-A as the experimental class and class VIII-B as the control class as the subject of the research.

The data collection uses the instrument of science skill test in the form of multi-item choice test as many as 15 questions that were adjusted to the science process skill indicators; observing, classifying, predicting, interpreting, and communicating. The observation sheet is used to view the learning implementation by using SiMaYang model interactive medium.

The data analysis is done descriptively to describe the result of pretest and posttest of increasing skill of science process. Based on the pretest and posttest result then n-Gain is calculated to know how far the improvement of students' science process skill is. It is calculated by using the formula proposed by Hake (2002) as the following:

$$n\text{-}Gain = \frac{\%\ \text{posttest score} - \%\ \text{pretest score}}{100 - \%\ \text{pretest score}}$$

Criteria *n-Gain*as seen on Table 1.

Table 1. Criteria *n-Gain*

n – Gain	**Criteria**
< 0,3	Low
0,3 <*Gain* < 0,7	Medium
> 0,7	High

The observation sheet is used to measure the learning behavior of the SiMaYang model. Observations are made by two observers. The scores of instructional learning are calculated in percentage of achievement by using the formula:

$$\%J_i = \frac{\sum J_i}{N} x\ 100\%$$

Information:
% *Ji* = Percentage of achievement of the ideal score for every aspect of observation at the i^{th} meeting
Σji = Total score of each observation aspect given by the observer at the i^{th} meeting
N = Maximum score (ideal score)

RESULTS AND DISCUSSIONS

The effectiveness of interactive media on learning of SiMaYang model is evaluated from the improvement of science process skill through learning achievement and observation on student activity in learning. The improvement of students' science process skill is shown by the *n-Gain*score that is the difference between the pretest and posttest result obtained by the students. The results of this study indicate that the average of *n-Gain* pretest and posttest of the experimental class and the control class indicates the high criterion (Table 2).

Table 2. Results of analyzes of pretest, posttest, and *n-Gain* in the experimental and control class

Test Class	Average of pretest ± Sd	Average ofposttest ± Sd	n-Gain	
			Score	Criteria
Experimental	48,72 ± 10,82	84,68 ± 6,49	0,712	High
Control	47,50 ± 10,01	71,43 ± 12,20	0,474	Low

The improvement of science process skills in the experimental class of human excretion system material is suspected to occur because the learning process by using interactive media can help students to be actively and efficiently involved. This is in line with the opinion of Mayer & Moreno (2002) that the use of multimedia technology in the learning process of science can increase the active participation of students as well as the effectiveness and efficiency of learning.In addition, the syntax of learning model SiMaYang usage has been in accordance with the achievement of competence indicators of science process skills. It provides motivation by providing an overview of the phenomenon of science in everyday life. The phenomenon of science in the process of science learning to clarify the concepts of science that are abstract can be done, among others, with the use of media so that learning objectives are achieved. Sunyono (2015) states that SiMaYang model is suitable for science topics which areabstract, there is a visual diversity, there are macroscopic and submicroscopic images, and it is symbolic. It is in line with Ferguson, et. al (2015) who say that interactive media is able to illustrate concepts to achieve specific learning objectives.

According to Hill and Korhonen (2014) concrete concepts in the learning process become fundamental in clarifying facts that are still abstract. This is in line with Liu's (2006) research results that abstract concepts are more easily understood when multimedia is combined with laboratory activities. The increase of *N-gain* in each science process skill indicator performed on each experimental class and control class is presented through the following diagram.

Table 3. Improvement on indicators of science process skills

Indicator	**Experimental Class**		**Control Class**	
	n-Gain Score	**Criteria**	**n-Gain Score**	**Criteria**
1	1,00	H	0,45	M
2	1,00	H	0,13	L
3	0,74	H	0,12	L
4	0,52	M	0,13	L
5	0,35	M	0,08	L

Information:
Indicators:1: Observing; 2: Classifying; 3: Interpreting; 4: Predicting; 5: Communicating
Criteria: L = Low, M = Medium, H = High

Table 3 shows the highest gain of *N-gain* science process skill in the "observed" indicator either in the experimental class or control class. Meanwhile, the lowest *N-gain* for the experimental class is in the “interpreting” indicator, while the lowest indicator in the control class is in the skills of "predicting","interpreting", and"communicating". The low

percentage of achievement on indicators of predicting, interpreting, and communicating in the experimental and control classes is due to not yet improvement onthe students' learning such as doing repetition of the material when at home and practicing science skills test. The effort that teachers have to do is to guide the students as in the learning stages contained in SiMaYang model learning syntax.

The first phase, the orientation phase, begins with the delivery of learning objectives andthe achievement of indicators of competence and provides motivation by providing an overview of the phenomenon of science in everyday life. The phenomenon of science in the process of science learning to clarify the concepts of science that are abstract can be done, among others, with the use of media so that learning objectives are achieved. In this phase students observe the various images on the media so that the observed science process skill indicators are achieved. It is in line with Sunyono (2015) that the SiMaYang model is suitable for science topics that are abstract as there is a visual diversity with macroscopic and submicroscopic images, and it is symbolic.

The second phase of exploration-imagination is where students see video shows, observe images, and work on worksheets contained in interactive media. This phase of the five indicators of science process skills is well explored; almost all students in the experimental class are able to work on student worksheets.This is demonstrated by the "high" *n-Gain* in the experimental class but is still lacking in careful attention to the drawing and limitations of time in working on student worksheets. The observer states that teachers have suggested to students to discuss in their respective groups to fill in the questions on the student worksheet. In this phase students are very enthusiastic and have active role.

This is in line with the opinion of Sunyono (2015) who states that the exploration stage is designed with collaborative, cooperative, and imaginative activities through various representations (verbal, visual, symbolic/mathematical, etc.), so that the information processing can take place optimally and the information obtained can be stored in length of memory to be used in the process of reasoning and remembering.

Developed interactive media is presented in text, graphics, images, audio, video, and animation. It is supported by Sunyono (2015) who suggests that students prefer to work with symbols and visual rather than just text as is common in conventional learning. Students prefer simple visualization than text lessons alone, in line with previous research findings that show that students prefer visual use in addition to verbal learning and that visual use in the classroom can improve student motivation. This is in line with Brunken et al., (2003) that the concept of liver function will be more easily understood by students using graphics, while the blood circulation system can be presented in the form of text, video, and animation.

Interactive media is not only through viewing activities, but other activities such as listening, observing, and discussing so as to build knowledge and skills of students. Schrader and Erric (2015) state that multimedia animation is potentially strong in improving students'

knowledge construction, synthesis skills, and is able to build relationships between knowledge.

In the internalization phase the students do the presentation of group work, and the teacher facilitates and encourages the students to comment on or respond to the work of the group presenting and provide the exercise or task to create individual activities in articulating imaginations containing questions about the excretion system in humans. The achievement of the science-process skill indicators communicates better in the experimental class than the control class. In this phase, the students of the experimental class are very enthusiastic in conducting question and answer discussion with other groups. It is supported by Sunyono (2015) who says that in the internalization phase students are invited to make discoveries through imagination, presentations, and individual and group activities.

This is similar with Khazaal (2015) in his research. He concludes that students working in groups get better learning outcomes. Group discussions provide opportunities for students to express their opinions and ideas associated with the results of data that have been processed to prove whether or not the hypothesis that is established.This process is very helpful for students in improving the science process skills on indicators of interpretation as evidenced by the value of *n-Gain* in the medium-grade experimental class and in the low-grade control class. Not yet high percentage on indicators of interpreting allegedly because in the sixth stage of conclusions or generalizations there are still groups that take longer than other groups in concluding the findings.This is because the students are not accustomed to making conclusions by using their own sentences just by observing the results of verification, so that this is where the teacher acts as a facilitator and helps students in improving the sentence arrangement in the conclusion.

The last stage is the evaluation phase used to get feedback during the learning process.Students have difficulties in doing the exercise of science skills given in this phase. The difficulties experienced are because all this time in the science learning process they are not trained to perform good scientific skills in observing the images, classifying, predicting, interpreting and even communicating, so that when students are working on the problem of science process skills, they feel unfamiliar predominantly in predicting indicators, interpreting data, and communicating. This is consistent with the opinion of Bunton, et al (2010) that learning with science process skills should be familiarized with the objective of bringing out individuals who can conduct research, ask questions, achieve scientific knowledge using scientific thought, and even use knowledge to solve problems encountered in everyday life.

The improvementon the students' science process skills in the experimental class is also supported by the implementation of learning using SiMaYang interactive media model as observed by two observers during the learning process. The results of the observations are presented in Table 4.

Table 4. The results of observation on the implementation of learning

Meeting	Rated aspect	% Gain	Information
1	Syntax	83,33	Very high
	Social system	80,00	High
	Reaction principle	80,00	High
2	Syntax	86,67	Very high
	Social system	86,67	Very high
	Reaction principle	86,67	Very high
3	Syntax	90,00	Very high
	Social system	96,67	Very high
	Reaction principle	93,33	Very high
	Amount	87,04	Very high

Overall the learning implementation using interactive media on learning model of SiMaYang has been done correctly. It is indicated from the achievement value ≥ 80%. This means that it has met the ideal quality of learning criteria and categorized very high. The result of observation is that the lowest learning implementation is at meeting 1. This is because the students are still not used to using interactive media. At the beginning the student's learning is not yet conducive, and thenit starts to decrease at each meeting as the learning activity gets better and conducive.

This very high level of execution indicates that the learning element in terms of syntax, social system, and the principle of reaction has been done well. This is consistent with Sunyono (2014) who says that a good learning model should have five main components: syntax, social systems, reaction principles, support systems, as well as the impact of instructional and companion impact.

The result of observation is that the lowest learning implementation is at meeting 1. This is because the students are not yet accustomed to use interactive media. At the beginning of learning the students are not conducive, but begin to decrease in every meeting as the learning implementation is gettingbetter and conducive. The observer states that in the learning process students are very enthusiastic and play an active role in doing every activity contained in interactive media. This is in line with Mayer and Moreno (2002) who says that the use of multimedia technology in the learning process of science can increase the students' active participation as well as the effectiveness and efficiency of learning.

CONCLUSION

Based on the results of data analysis and discussion interactive media on learning model SiMaYang is able to improve students' science process skills. This can be seen from the average acquisition of *n-Gain* which indicates high criteria and the implementation of learning is very high. The conclusion of this research is that the interactive media of SiMaYang model is effective to be used to improve students' science process skill especially on human excretion system material.

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