The Effect of Guided Inquiry Model with Interactive Multimedia Towards Student’s Generic Science Skill Based on Learning Styles

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Abstract: This study aims to examine the effect of guided inquiry model with interactive multimedia toward generic science skills of students’, to examine the effect of learning styles on generic science skills, and to examine the effect of interaction between guided inquiry models in interactive multimedia with learning style toward generic science skills of learners. This research including quasi experiment with 2 x 3 factorial design. The research sample was determined by cluster random sampling technique and obtained 68 students divided into 2 groups; experimental groups and control groups. Indicators of generic science skills studied are indirect observation, sense of scale, symbolic language, and mathematical modeling. Data were analyzed using N-gain score and two-way Anova. The results of the analysis of the N-gain test show that the experimental group has a higher science generic skill and the highest increase occurs in symbolic language indicators. The result of hypothesis analysis shows that: 1) there is influence of guided inquiry model with interactive multimedia toward generic science skill; 2) there is no influence of learning styles on generic science skills; and 3) there is no interaction effect between guided in interactive multimedia assisted auxiliary model to generic science skill.

1 INTRODUCTION

In learning physics, the students should to understood a lot of signs and symbols, reading graphics and table. The theory of physics is much stated in mathematics notation then physics will never move from similarity to solve a problem or to uncover natural phenomena. Meltzer (2002) said that this thing is effecting the students with emerge the opinion that the most hardship in learning physics is mathematics completion. The skill is not about motoric movement only but mental function cognitively also. Generally, generic skill is decided from science process skill that is connecting the skills process with components of science that will be learned.

Paquette (2007) said is “A generic skill is a process that can be applied to knowledge in more than one application domain, for example to perceive, memorize, assimilate, analyze, synthesize, or evaluate knowledge items. A generic skill is described by an action verb, sometimes with performance indicators such as “in new situations” or “without help” that serve to make the skill more specific, while remaining independent from any application domain.” Hager et al. (2002) also defined that “The term generic skills is used widely to refer to a range of qualities and capacities that are increasingly viewed as important in higher education.” These include thinking skills such as logical and analytical reasoning, problem solving and intellectual curiosity; effective communication skills, teamwork skills and capacities to identify, access and manage knowledge and information, personal attributes such as imagination, creativity and intellectual rigour and values such as ethical practice, persistence, integrity and tolerance.

There are nine kinds of science generic skill that can be improved through physics study which cover (1) direct observation; (2) indirect observation; (3) sense of scale; (4) simbolic language; (5) logical self-consistency; (6) logic inference; (7) causality; (8) mathematic modeling; and (9) building the concept (Brotosiswoyo, 2002).

One of the efforts to improve students is by applying guided inquiry model. Inquiry learning model is a model of learning which involves the most throughout the students' ability to find and investigate the systematic, critical, logical, analytical so that
students can formulate its own discovery with aplomb (Ali and Spencer, 2012).

In experimental activities, students can also develop scientific skills and social skills (Gunawan et al. 2017). Inquiry based learning is an approach which promises to improve science teaching by engaging students in authentic investigations, thereby achieving a more realistic conception of scientific endeavour as well as providing a more learner-centred and motivating environment (Kubieck, 2005). Herron (1971) said guided inquiry is one type of inquiry learning in which the learners will investigate a teacher-presented (or computer-presented) question using their own designed or selected procedures.

Along with the development of science and technology, beside innovated learning, also need to innovate the media of learning such as real media even abstract media. Finkelstein et al. (2005) stated that computer can be used to bear the implementation of physics computer can be purposed in physics learning process. Using an interactive media became one of computer utilizing in physics learning.

Cairncross and Mannion (2001) concluded that multimedia can bring a number of advantages to education. The key features of multiple media, user control over the delivery of information and interactivity can help learners come to a deeper understanding through, supporting conceptualization and contextualization of the new material being presented, actively involving the learner in the learning process, promoting internal reflection.

The interactive word in multimedia means that user interacted with application programs and interactive information application which aims that user can get the information they need. Interactive multimedia influences thinking skill such as creativity and problem solving skill (Gunawan et al. 2017; Gunawan et al. 2017).

In addition to the use of learning models and instructional media, it can be expected that the characteristics of learners can influence their learning outcomes, and one of the characteristics is learning styles. Learning styles are related to absorbing, processing, and conveying information. So that learning style is the main modality in learning.

Cassidy (2010) described a long learning style. A. Kolb and B. Kolb (2005) defined learning styles as a way that people tend to choose to receive information in their environment and process information. Learning requires concentration, therefore the situation and condition for concentration is closely related to learning style. If each individual can manage under what conditions, where, when and how the learning style, then learning will be more effective and efficient so that the results of learning is higher. The result of the research by Cano-Garcia and Hughes (2000) shows that there is a positive correlation between learning styles and student learning results.

In general there are three trends of learning styles such as visual learning style, auditory, and kinesthetic learning style. If a learner has a visual learning style it will be more happy and quick to understand when a material is explained by using a visual display. Learners who have an auditory learning style will be happy and more easily understand the material when it presented with sound. Unlike the kinesthetic learning style, they will be happier and easier to understand if they learn by moving, touching, or doing something.

Based on the above explanation, the researcher is interested to conduct research in guided inquiry model of interactive physics on the generic skills of students' science.

2 RESEARCH METHOD

The type research is quasi experiment to find the effect of certain treatment on the variables studied and in the condition controlled by 2 x 3 factorial design. The samples were chosen by using cluster random sampling technique, so that two classes were selected which would be the experimental group and control group.

Based on the design that is determined, so the process of research is the teacher gives pretest to know the early ability of generic science skill of learners, and the tendency of learning style after that learners get different treatment, that is experimental class is taught by using guided inquiry model with interactive multimedia assisted while control class taught by using conventional learning. After the two classes received different treatment, the participants were given back posttest to know the final result and increase the generic skill of the learner.

Generic science skill data is obtained during pretest and posttest. The instrument used in the form of essay amounted to 12 questions. Each question represents generic science skills indicators to be studied. The generic science skill indicators to be studied in this research are indirect observation, awareness of scale, symbolic language, and mathematical modeling. Selection of generic science skill indicators studied by considering the model used and the characteristics of the material being taught. In addition to the generic skills science instruments, in
this study is also required learning style instrument to determine the tendency of student learning styles. The learning style instrument is double-choice and there are three choices of answers per item, item 20 questions. Before the instrument is used, it first validated the expert as well as empirical validation.

After all the data were collected, the data were analyzed by using a normalized gain test to see the increase of generic science skills and the two-ways Anava test to see the effect of the model, learning style, and interaction both in influencing generic science skills.

3 RESULTS AND DISCUSSION

Generic science skill data when pretest and posttest can be seen in Figure 1.

Figure 1: Comparison of the average scores of generic science skill on both group.

Figure 1 shows that on the pretest score, control group has a higher generic science skill score than the experimental group. While the experimental group posttest is superior to the control group. The experimental group gets an average rating is 74.74; while the control group got an average score is 70.39, so that the increase experienced by the experimental group.

The total number of students in the experimental group, the auditory learning style dominates as many as 16 students, while kinesthetic is only owned by 5 students. Similarly, control group are dominated by auditory learning style groups with 18 students, and visual learning style is 8 students, and kinesthetics learning style is 6 students.

Figure 2: Comparison of the average N-gain scores Generic science skills on both group based on learning style.

In terms of their respective styles in both the control and experimental classes, kinesthetic learning style groups in the experimental and control class have the same average N-gain values as greater than the auditory and kinesthetic learning style groups. As seen in figure 2 groups of visual learning styles and auditory learning styles in the experimental group have an average value of N-gain of almost the same only the difference is 0.02; and in the control group for the visual learning style and the auditory learning style group had an average difference of N-gain is 1.54 and superior to the auditory learning style group.

The experimental group received the highest score on symbolic language indicator with a value 79.84 and the lowest increase in the awareness indicator sense of scale is 55.76. The increase for each generic science skill indicator not only occurs in the experimental group but also occurs in the control group, where the highest increase is in indirect observation indicator with a value is 77.12, and the lowest increase is in the mathematical modeling indicator with a value is 27.39 as shown in Table 1.

Hypothesis test is done after the prerequisite test is normality test and homogeneity test. Based on the test with Kolmogorov- Smirnov test, the significance value for posttest science skills skill in the experimental group was 0.055 > 0.05, and in the control group is 0.200 > 0.05. Both have a value greater than the stipulated significance level is 0.05. So it can be concluded from normality test data obtained normal distributed
Table 1: Recapitulation of N-gain Score for Generic Science Skills on Each Indicator.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>N-gain Score (%)</th>
<th>Experimental Group</th>
<th>Control Group</th>
<th>Δ(g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>KGS 1</td>
<td>70.43</td>
<td>77.12</td>
<td></td>
<td>6.69</td>
</tr>
<tr>
<td>KGS 2</td>
<td>55.76</td>
<td>45.31</td>
<td></td>
<td>10.45</td>
</tr>
<tr>
<td>KGS 3</td>
<td>79.84</td>
<td>76.05</td>
<td></td>
<td>3.79</td>
</tr>
<tr>
<td>KGS 4</td>
<td>55.94</td>
<td>27.39</td>
<td></td>
<td>28.55</td>
</tr>
</tbody>
</table>

Information:
- KGS 1: Indirect Observation
- KGS 2: Sense of Scale
- KGS 3: Symbolic Language
- KGS 4: Mathematics Modeling

Homogeneity test for posttest value of generic science skill is obtained at 0.815 > 0.05, because the value of significance obtained is greater than the level of significance established then the data obtained homogeneous. After the test of normality and homogeneity have been qualified, then test the hypothesis with two way Anava with the help of SPSS 16 for windows. In Table 2. will show the results of the hypothesis test.

Table 2: The data of result test hypothesis.

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MIT+MI</td>
<td>1</td>
<td>200.805</td>
<td>4.458</td>
<td>0.039</td>
</tr>
<tr>
<td>GB</td>
<td>2</td>
<td>21.216</td>
<td>0.471</td>
<td>0.627</td>
</tr>
<tr>
<td>MIT+MI*GB</td>
<td>2</td>
<td>15.136</td>
<td>0.336</td>
<td>0.716</td>
</tr>
</tbody>
</table>

Information:
- MIT : Guided inquiry model
- MI : Interactive multimedia
- GB : learning style

The results of two ways Anava test based on Table 2. show that the guided inquiry learning model with interactive multimedia is influence toward the variable of generic science skill, with obtained by F value 4.458 with significance 0.039 < 0.05. Thus the result of the first hypothesis testing is that there is influence of guided inquiry model with interactive multimedia support to generic science skill. In learning style is influence toward the variable of generic science skill, the value of F is 0.471 with significance 0.627 > 0.05, thus the result of testing the second hypothesis is that there is no influence of learning style to generic science skill. In the interaction between guided assisted interactive multimedia models for the dependent variable of generic science skill, the value of F is 0.336 with significance 0.716 > 0.05. The third hypothesis test result is that there is no interaction effect between guided inquiry model with interactive multimedia support to generic science skill.

The results in this research show that the influence of guided inquiry model with interactive multimedia toward generic science skills. Harahap et al. (2017) also showed that the scientific inquiry learning model influences the students’ generic science skill. Through this learning model, students are faced with a scientific activity, such as skilled in observing, measuring, classifying, drawing conclusions, and communicating the findings, so it can be concluded that the model scientific inquiry learning can improve student learning outcomes (Lederman and Antink, 2010).

Evans and Nicola (2006) stated that students who are learning with interactive multimedia have good learning outcomes than students who are learning with noninteractive multimedia. Otherwise supported by Johnson and Mayer (2009) states that students who learn with multimedia better than those who do not.

According to Hussain (2011) inquiry scientific model is better than conventional learning model. It caused a learning model scientific inquiry can help to provide an explanation which is constructed so that students learn more investigation, resulting in the investigation of the students will be accustomed to observing, formulating problems in mathematical modeling, to which some of these components is an indicator of generic science skills.

So and Kong (2007) showed that there were significant improvements in learning achievement in both classes, the teaching with a learner-oriented approach with less teacher controlled over the use of multimedia components resulted in learners better achievement. The design of teaching based on inquiry learning with multimedia learning resources and the shift to a more learner-oriented inquiry approach.

Indicators of awareness of scale can be trained as learners observe an object and conduct an investigation. The third generic science skill indicator is symbolic language, in this indicator the learner is required to understand the symbols contained in the quantities of physics and measurement, such as the symbolic meaning of dimension, symbol of the unit, and other symbols.

In addition to these three indicators mentioned above, in this study also examines the ability of learners in mathematical modeling. The inquiry stage that can train these skills is when they perform the data retrieval and data analysis. So it is clear that the guided inquiry model with interactive multimedia assistance should be able to improve the generic skills of learners’ science.

Testing the second hypothesis about the influence of learning styles on generic science skills to get the conclusion that there is no influence of learning styles
on the dependent variable. The results of this study are not in line with some previous research results among them Vaishnav (2013) stated there is a significant influence of learning styles on learning outcomes.

Learning style is a way that is felt by someone to get or process information. So it should be by knowing the learning style then one can more easily learn the desired information. But in this study provides results that intersect with the theories that have been popularized by some experts. Fleming (2006) described learning styles are the methods applied by each individual in interacting with his environment in order to obtain, process, interpret information that is beneficial to the desired experience or skill.

Learning styles measured in this study are visual, auditory, and kinesthetic learning styles. Learners may have more than one learning style, which means it may have two learning style trends, but there will only be one that is very dominating from the learning style. During the learning process the teacher has designed in such a way that the learning in the sense of fair by each learner who has the tendency of different learning styles without dominating to only support one learning style in the learning process.

Researchers suspect there are several factors so that the learning style does not affect the generic skills of science and mastery of the physics concept of learners. This can happen, first; researchers suspect that the questions contained in the learning style instruments used are not appropriate to provide clear information about the types of learners' learning styles, so the error in analyzing the learning style of the learner results can occur. Second; learners are not serious in filling in the given learning style instruments, so that teachers when analyzing the influence of their learning styles on generic science skills and mastery of concepts are not as expected. Third; if reviewed during the pretest and posttest test, Outside of teacher supervision, it is possible that learners see the answers of other learners, so it will be the same value between learners with different learning styles.

Although the second hypotheses are rejected it does not mean that there is no increase in generic science skills in learners with different learning styles. Experimental group and control group is dominated by kinesthetic learning style groups.

The absence of the influence of learning styles on the generic skills of science, in addition to several causes that have been described above, the researchers also suspect that the occurrence of grouping activities in the process of learning, so did not close the possibility of learners with different learning styles and initial ability value the different will mix with each other, discuss, so they can exchange ideas and have the same skills and understanding. Learners with different learning styles have almost the same value or the same ability improvement, so this is what causes the absence of the influence of learning style on skills generic science learners.

Based on hypothesis testing related to interaction between guided inquiry model and interactive learning style toward generic science skill, concluded that there is no interaction effect. The results of this study are similar to the results of research. Gunawan (2016) showed that there is no interaction of learning models with learning styles in influencing learning outcomes.

To discuss the effect of interaction on the results of this study, we need an analysis of the two previous results in this study on generic science skills, namely: 1) there is influence of guided inquiry model in interactive multimedia with generic skills of science and 2) there is no influence of learning style to generic skill science. When examined, the first and second results are the opposite of each other, that is “influential” and has no effect”, this result is thought to be the cause of the absence of interaction effects on the third research result.

In relation to the learning model, learners who learn with guided inquiry model with interactive multimedia have a higher generic science skills than those who do not study with those model. In terms of learning styles, learners with visual, auditory, and kinesthetic learning styles possess the same generic science skills. If learning style variables are ignored then learners who are taught with guided inquiry models with interactive multimedia help still have higher science process skills. Therefore generic science skills are not dependent on learners’ learning styles, but depend on the model taught them.

4 CONCLUSIONS

Based on the result of data analysis and discussion, it can be concluded that there is influence of guided inquiry model with interactive multimedia support to generic science skill, but there is no influence of learning style to generic science skill, and there is no interaction effect between guided inquiry models with interactive multimedia support toward generic science skill.
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