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The Effect of The Science Web Module Integrated on Batik's Local Potential Towards Students' Critical Thinking and Problem Solving (Thinking Skill)

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ABSTRACT The 21st-century learning paradigm requires teachers to provide teaching materials that can develop students' thinking skills. This research aims to determine the effect of the web module science integrated local batik potential toward the thinking ability of seventh-grade students of junior high school. The research method used was quasi-experimental design with a posttest-only design. The instrument used is about thinking skill. The data analysis technique is a Kruskal Wallis test and Effect Size. The results of the research showed that there were differences in students' thinking skill between the experimental class and the control class, as indicated by the Kruskal Wallis test, gives significant results. Web science module integrated with local batik potential has a significant influence on students' thinking skill as indicated by Cohen's effect size score of 0.8. The results of this research can be used to provide insights to science teachers create innovative learning materials to make students more interested in learning science and practicing thinking skills of students.

Keywords Science web module, Local batik potential, Thinking skill

1. INTRODUCTION

The 21st century is known as the century of the development of science and technology, which has developed rapidly in all aspects of human life. The problems that occur in this century can only be solved by improving and mastering science. Science can be enhanced through education. The 21st-century learning paradigm demands a change in school to produce excellent human resources. Therefore, a school must be able to develop all the potential in students so that students have adequate provision to overcome global challenges and competition.

Partnership for 21st Century Learning (P21) developed 21st-century educational frameworks throughout the world. One of the 21st-century skills in the context is learning and innovation skills. Learning and innovation skills include critical thinking skill and problem-solving as thinking skills. These skills are keys in learning to generate superior human resources and essential competency required to overcome global competition.

Thinking skill is an essential ability that trains the brain to think critically and logically in understanding information, using analytical ability, solving the problem, and appropriately increasing decision-making ability (Prajapati, Sharma, & Sharma, 2017; Salonen, Hartikainen-Ahia, Hense, & Keinonen, 2017; Butterworth, & Thwaites, 2013; Prima, & Kaniawati, 2011). According to Salih (2010), Smit (2015), Roekel (2011), thinking skill is essential so that students can optimize thinking skill so that they can improve problem-solving ability in daily life, analyze thinking to ensure that students have made the right decision, and can be a provision to compete in a global world.

Efforts to develop students' thinking skill can be made through learning activities, one of which is learning Science. Science is a systematic and holistic knowledge associated with natural phenomena obtained through scientific methods. Through science learning, humans not only gain understanding regarding natural phenomena but also their interaction with technology and society (Wisudawati, & Sulistyowati, 2014; Susilowati, 2015).

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Science learning in schools mostly explains about the development of science in the west so that knowledge is not contextual because students cannot see directly and very far, even though science learning should be taught contextually by integrating the local potential of the area where students live. Ibrohim, Afiat, Nurdiana, Estiningsih, & Martiana (2014); Novana, Sajidan, & Maridi (2014); Mulyanto, Masykuri, & Sarwanto (2017) suggested the integration of local potential in the region so that learning can improve thinking skill and process skill, be more contextual and meaningful, and knowledge can also improve care and responsible for the environment.

One of the local potentials that develop in Yogyakarta is batik. Parmono (2013); Wijayanti (2014) explained that batik is a cultural heritage that contains local values; each motif has symbolic and philosophical meaning. Batik initially may only be used by the royal family, but now it can be used by all people. Batik until now is used for performances of dance, ceremonies, and Kraton rituals of Yogyakarta. Batik is made through several processes; in that process, science content can be analyzed that can be raised in learning. Batik making is using chemicals if batik industrial waste is disposed of into the environment without being processed, it will cause environmental pollution. This environmental pollution is found in the necessary competency in Curriculum 2013 in KD 3.8, namely 'analyzing the occurrence of environmental pollution and its impact on the ecosystem' and KD 4.8, which is writing about the idea of solving pollution problems in the environment based on observation.

One of the efforts to develop students' thinking skill, learning activities are carried out by actively involving students. The implementation of learning requires appropriate learning tools, one of which is teaching the material. Teaching material is used to support the learning process and achieve basic competency. Based on the observation in junior high school of 2 Gamping, teaching material used by teachers are in the form of conventional teaching material in the form of printed media which include government-sponsored textbook, lesson textbooks and student worksheets purchased through school suppliers. Teachers have not maximized computer and internet facilities in the school, especially in the learning process and for creating website-based teaching material, even though now they have entered the era of developing technology and information.

The use of ICT in learning has the benefit of making it easier for students to find information, concretize abstract messages, and improve efficiency and effectiveness in learning activities to enhance the quality of learning (Rahmayanti, 2015). For this reason, it is necessary to provide innovative teaching materials to improve the quality of learning. Kusuman, Mukhidin, & Hasan (2016) stated that the use of innovative teaching materials creates interesting learning, fosters interest, motivation, reduces dependency and gets ease in learning each indicator contained in the learning tool compiled by the teacher. Teaching material that can be used is the science module web. The module is chosen because it has the characteristics of self-instruction and self-contained, so students are trained independently to manage their learning time and understand the subject (Kaur, Singh, & Singh, 2017). In addition, the module is made in the form of a web module so that students can learn independently by accessing the module at school or at home (Weni, & Isnaini, 2016; Linda, Herdini, & Putra, 2018). Based on the explanation above, this research was conducted to determine the effect of the science web module integrated on batik's local potential towards students' thinking skill.

2. METHOD

This research is classified as quasi-experimental research with posttest only design, according to Creswell (2012) that can be seen in Table 1. This study has two variables, namely independent variables and dependent variables. The independent variable in this study is a science web module integratedpotential local batik (X), while the dependent variable is thinking skill (Y2).

The population of this study was 192 students of grade VII of junior high school of 2 Gamping in the academic year of 2018/2019 divided into six classes; those are class VII A-VII F. The sampling technique used was cluster random sampling. Each class is assumed to have the same ability because class grouping has been determined by the school based on knowledge and gender that has been spread equally. The sample in this study were students from two classes used, namely VII E as the experimental class

Table 1 *Postest control group design*

Group	Treatment	*Posttest*
Control class	X_a	O_2
Experiment class	X_b	O_2

Table 2 *Thinking skill* questions blueprint

Aspect	Indicator	Number of Items
Comprehend the information	Identify problems from the information obtained from many resources.	1
Using thinking	Analyzing information obtained in full/complex.	2
Make consideration and decision.	Formulate the strategy to solve the problem.	1
Reflecting the decision and process critically	Choosing the best solution for solving problems.	1

(Adapted and modified: Trilling, B., & Fadel, C., 2009 & Pacific Policy Research Center, 2010)

and VII F as the control class. Each class consists of 32 students.

The instrument used to collect data in the form of questions about thinking skill. Thinking skill questions are used to measure students' thinking skill after learning using the science web module integrated with potential local batik. Thinking skill questions are arranged based on the thinking skill blueprint that can be seen in Table 2.

The data analysis technique used is the K-Independent Sample Test / Kruskal Wallis test and effect size. The K-Independent Test / Kruskal Wallis test was used to find out there were no differences in students' thinking skills using the web science module with students' thinking skills using teaching materials used by the teacher, while the effect size was used to determine the effect of the science module on students' thinking skills

3. RESULT AND DISCUSSION

The thinking skill of students is known from the results of the students' scores after carrying out on thinking ability. Data on the thinking skills of experimental class and control class students can be seen in Table 3. Table 3 shows that the average thinking skill value of experimental class is 80.16, and the average thinking skills value of control class is 75.31. Based on these results, the average of the thinking skills value of the experimental course is higher than the average value of thinking skills in the control class. The value of students' thinking skill can be seen in more detail by looking at the comparison of the data thinking skills value of the experimental class students and the control class of each indicator that can be seen in Figure 1.

Figure 1 shows that the average thinking skill of each indicator in the experimental class and control class is different. The trial class has an average of each thinking skill indicator that is higher than the average for each control class thinking skill indicator. This shows that there are differences in thinking skill of students who use the

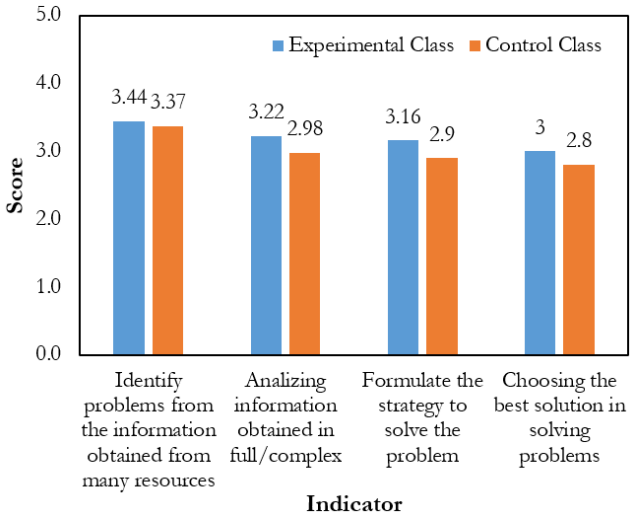

Figure 1 Average comparison of thinking skill for each indicator

Table 3 Score data *thinking skill*

Description	Experimental class	Control class
N	32	32
Maximum score	100	80
Minimum score	75	40
Average	80,16	75,31

Table 4 Kruskal Wallis thinking skill test results

Kruskal Wallis	Results
Chi-Square	13.199
Df	1
Asymp. Sig.	.000

science module web with thinking capability of students who use teaching material used by teachers. The difference is supported by the results of the K-Independent Sample Test / Kruskal Wallis test with SPSS 22 using the 0.05 significance level presented in Table 4.

Table 4 shows that the result of the Kruskal Wallis test obtained the Asymp value. Sig. Amount of 0,000 so Asymp. Sig. < α with α of 0.05, H0 is rejected. Therefore, it can be concluded that there is a difference in thinking skill of students who use the science web module integrated with potential local batik by thinking ability of students who use natural science teaching material commonly used by teachers. The subsequent analysis is to find out the magnitude of the effect of the science module web integrated local potential batik towards thinking skill of students using Cohen's effect size. Based on the results of the calculation of the thinking skill value using the Cohen effect size equation, it obtained a score of 0.8 with a high category. It can be said that science web module integrated local potential batik has a high influence on students' thinking skill. The results showed that learning to use the science web module can train students ' thinking skills. In this study, it was found that there was the difference in thinking skills learners who use the science web module with thinking skills learners use learning materials commonly used science teachers, as well as the web module science, integrated potential local batik has a high influence against the thinking skills learners.

Science learning using the science web module not only displays a series of material but contains learning models, images, videos, practice / task questions, downloads, other website link related to the content contained in a web page that can be accessed online so students can learn independently with or without the help of the teacher in order to achieve the specified competencies (Fitri, Kurniawan, & Ngazizah, 2013; Setiyadi, Ismail, & Gani, 017; Tambunan, 2013). According to Kaur, Singh, & Singh, (2017), Mangesa, & Dirawan, (2016); Johar, Risdianto, Fera, & Indiyati, (2014) explained that the science module web has the characteristic of being able to teach in a language that is easily understood by students. For learners, science module web can help students to think holistically

and systematically related to the learning material and can be used for independent learning. For teachers, it can make more accessible to design learning because the content is presented in one complete competency which includes learning objectives, material, learning activities, assessment, and assessment feedback. Science module web learning is learning that refers to constructivism theory that helps students gain the learning experience and knowledge to find and formulate knowledge through the exploration of material-related information together with other students so that they can train students' thinking skills (Noel, 2014; Smit, 2015; Pattiwael, 2016).

Thinking skills are the necessary capabilities that train the brain to think critically and logically in understanding information, using the analytical capabilities, solve issues, as well as improved decision-making ability (Trilling & Fadel, 2009). Science web module integrated potential local batik is made with joining the material, and the concept of content had known by the students toward their environment. Hence, the pupils can relate the knowledge that already gained with the new experience easier. The local potential of batik integrated into science web module can be seen by students in the process of making batik using chemicals that have heavy metal content. Batik waste containing heavy metals if not treated properly can cause pollution of the environment.

Learning activities with the science web module asks learners to discuss problems of the identification of the related environmental pollution arising out of batik waste, analyzing the causes of the occurrence of environmental pollution due to debris the results of activities batik making, interpreting the results of a laboratory test related waste batik, formulate the best strategy in providing solutions that can be done to solve the problem of environmental pollution due to waste batik, as well as suggested solutions best solve the problem of environmental pollution due to waste batik. Therefore, the learners thinking skills can be adequately trained. Science web module learning integrated the local potential of batik encourages teachers to connect material taught with real/contextual world situation so that they can prepare to identify concept related to potential local batik, practice logical thinking skill, critical, and problem-solving, are interested in science, and grow concern for the environment (Lia, Udaibah, & Mulyatun., 2016; Agung, 2015; Ilmiyah, Wasino, & Utomo, 2019; Syabandari, Firman, & Rusyati, 2017).

The results of this research are consistent with the research that has been done Anafidah, Sarwanto, & Masykuri (2017) conduct research-based CTL module development to improve thinking skills. The module used contains material application law of Newton in life to improve thinking skills. Indicators used include thinking skills provide an explanation, the skills of solving problems is appropriate content, concluded, and organize problem-solving strategies and tactics. The results showed that the learning modules could improve thinking skills based on N-gain of 0.36 categorized are, and there is a difference in the average mastery of physics students before and after using the module based on paired t-test earned *Asymp. Sig* (2-tailed) less than 0.05 i.e. 0.000.

Other studies conducted Pistanty & Mingle (2015) related science module to improve thinking skills. The module used contains material pollution and its impacts on humans and the environment to train thinking skills. Indicators used include thinking skills to understand the problem, analyze the problem, make the right decisions, logical, and systematic, and consider the most appropriate choices from various viewpoints. The results showed that the module could improve thinking ability based on normalized N-Gain categorized are by a score of 0.62.

4. CONCLUSION

Based on the formulation of the problem, exposure to data, the result of research, and discussion, this study concludes that there are differences in thinking skill of students between the experimental class and the control class as indicated by the result of the Kruskal Wallis test with the Asymp value. Sig. of 0,000. The science web module integrated with potential local batik, has lots of influences on students' thinking skill as indicated by the Cohen effect size score of 0,8.

For the researchers who will conduct similar research, the advice given to further researchers is expected to examine more about the effect of the science module web that is integrated with different local potential and the influence of the natural science web module on different variables with different background setting.

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