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Research Article

Needs Analysis for the Development of Science e-Modules Assisted with Kvisoft Flipbook Maker on the Basic of Project Based Learning on Heat and Transfer Materials to Improve Creative Thinking Ability in the Pandemic Period

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Abstract.
Creative thinking is a high-order thinking skill that is considered to be an important skill to succeed. Creative thinking abilities include fluency in thinking, flexibility of thinking, originality of thinking, and detailed thinking (elaboration). The lack of teaching materials on the topic of heat transfer and the inability to think creatively about the topic negatively affect students. Therefore, this study aimed to analyze the need for the development of an e-module using the *Flipbook Maker* application. The need analysis for the e-module was analyzed in line with creative thinking abilities to support online learning. This study used a qualitative method, with the research subjects being teachers and students of grade VII of Junior High School in Sukoharjo. Data collection techniques employed were questionnaires and interviews, in which the data were then analyzed descriptively. The study revealed that students' creative thinking abilities were still low on indicators of flexibility and originality. For these reasons, project-based learning (PJBL) is a learning model that can be applied to improve students' creative thinking abilities. In addition, teachers and students need e-modules to support the online learning process. Thus, this research can be elaborated by developing a natural science e-module assisted by a Flipbook Maker based on PJBL to improve students' creative thinking abilities.

Keywords: Science e-Modules, Project Based Learning, Creative Thinking Ability

1. INTRODUCTION

According to the Rainbow of 21st-Century Knowledge Skills, higher-order thinking skills are learning and innovation skills. Learning and innovation skills encompass critical thinking, problem-solving, communication, and creative thinking. In this case, as a developing country, Indonesia will not be able to progress as long as it has not improved the quality of its human resources. The nation's quality of life can increase if an established

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education system supports it. All countries, whether underdeveloped, developing, or even developed countries, need the ability to develop creative thinking.

Creative thinking skills have a strategic role in advancing science and technology. Creative thinking has become an essential skill for adapting to fast changes [1]. Creative thinking skills are also defined as abilities required in all subjects [2]. Several previous studies have shown facts in low creative thinking and problem-solving skills in Indonesia. Low creative thinking and problem-solving skills were found on a national scale [3–5].

In Indonesia, the primary paradigm of the world of education uncovers that existing learning only strengthens the power of the left brain (intellectuality). Meanwhile, right brain development (creative thinking) is still lacking. The impact of the current paradigm is the lack of Indonesian creativity and prosperity. The 2010 Global Creativity Index published by the Martin Prosperity Institute (MPI) showed that Indonesia was ranked 81 out of 82 countries [6]. In addition, based on research conducted by 139 countries in 2015, Indonesia's position was very low at 67th. Indonesia is still inferior to other countries in Southeast Asia, such as Singapore (ranked 7) and Malaysia (ranked 24). Research on the low GCI index indicates that something is wrong with Indonesian education. In fact, all education experts agree that, ideally, education is not just a transfer of knowledge from teachers to students. More than that, education should inspire to bring out the creativity and innovation of students.

Specifically, the analytical study results of eight National Education Standards at SMP Negeri 2 Mojolaban showed that it had a GAP of 8.33%, with the highest being the process standard of 3.70%. Thus, improvements are needed in the learning process, including assessments to improve creative thinking skills. Then, the interview and observation results presented several problems that might cause low creative thinking skills, as indicated by the standard GAP process results. Here, the training of creative thinking and problem-solving skills can be conducted by applying certain learning models and activities in learning modules (Mc Gregor, 2007). Furthermore, the use of the module designed as training received positive feedback from students [7]. Therefore, teaching materials that can make the learning process fun must be held. One of them is an attractively packaged e-book-based module.

In this case, the Flipbook Maker application is a professional software converting pdf to flash book back and forth. This software can create HTML 5 and flash flip books from all types of files: pdf, images, Word, PowerPoint, Excel, and more. This application can be classified as mobile learning or flexible learning to time and place. According to Handayani [8], mobile learning is one type of learning media which is easy to carry

everywhere and can be used as desired by the user as long as there are adequate gadgets.

To empower thinking skills of strategic value in the 21st century, e-modules can be developed using the syntax base of a learning model. On the other hand, [9], in research on immersion classrooms for natural and social science subjects, demonstrated that learning models emphasizing collaboration and group assignments promoted active and more in-depth learning. Here, the project-based learning (PjBL) model is a teaching approach built on learning activities and real tasks, which provide challenges for students related to everyday life to be solved in groups [10].

In this study, preliminary interviews were conducted in early August 2020, followed by observations of students and teachers, and reinforced by student test scores. Related to that, heat and its displacement are one of the materials taught at the junior high school level. The demands of the 2013 revised 2017 curriculum place this material in basic competence (KD) 3.4, expecting students to analyze the concepts of temperature, expansion, heat transfer, and their application in everyday life, including the mechanism for maintaining a stable body temperature in humans and animals. However, the material of heat and transfer in natural science learning is difficult for students. Some students stated that they still had difficulty analyzing the concepts of temperature, heat expansion, and heat transfer. This statement was then supported by student learning outcomes, showing that the score for this material was still below the minimum mastery criteria (KKM). The KKM for natural science subjects at the junior high school is 75. Meanwhile, some students still had scores below the KKM.

Based on this background, this problem needs to be solved immediately. One of the solutions is to develop e-module learning media with the help of Flipbook Maker based on project-based learning on heat and transfer materials to improve the creative thinking skills of grade VII students, packaged creatively and innovatively as a solution for low student learning outcomes during the pandemic.

2. RESEARCH METHOD

The method used in this research was descriptive qualitative. This e-module was designed utilizing the Flipbook Pro software version 4.0, Ms. Office Word to create the text content of the module, Corel Draw and Photoshop to design the cover page for the module and the paper theme for the teaching module. Sampling was done by random sampling technique. The research subjects were natural science teachers and 15 seventh-grade students. Data collection techniques were carried out through

questionnaires, interviews, and questionnaires. The questionnaire was given to students to determine the sources and learning conditions used. The interviews were conducted to confirm the questionnaire results. Meanwhile, a questionnaire was given to students to determine students creative thinking abilities. The questionnaires were measured using a Likert scale with the following alternative answers: always, often, rarely, and never. The highest score for each statement is 4, while the lowest score is 1. The data analysis technique used was descriptive to determine the percentage of answers to the statement. The questionnaire was then analyzed using the following formula:

$$P\ (\%) = \frac{Score\ of\ each\ indicator}{Total\ score\ of\ each\ indicator} x\ 100\% (1)$$

The criteria for the percentage of scores for each component of creative thinking ability are presented in Table 1 (Shriki, 2013).

TABLE 1: Criteria for the mean score of creative thinking skills.

Percentage	Category
<55%	Low
≤55%-<75%	Moderate
≥75%	High

3. RESULTS AND DISCUSSION

Based on the needs analysis through questionnaires, it was known that the teaching materials used by students still had shortcomings in terms of completeness of materials and illustrations or pictures. Then, the problems presented also had not spurred students to express ideas actively. It was relevant to the interview results that students could not learn independently with the existing handbooks. Students still needed an explanation from the teacher to understand the material. The questionnaire and interview results revealed that students needed teaching easier-to-understand, more effective, and more interesting and efficient materials for independent study, especially during online learning during the pandemic. The interview results with teachers also uncovered that teachers had difficulties delivering material online. If the teacher usually uses the experimental method or discovery learning in the face-to-face classroom, the teacher should look for other learning alternatives for online learning so that students can achieve learning goals. The teacher stated that teaching materials in e-modules with project-based learning steps were needed to support students' independent learning.

In addition, it has been researched that the utilization of technology in supporting the learning process can increase the efficiency and effectiveness of the learning process

[11–13]. Based on the responses of both teachers and students to e-modules, it could be concluded that teachers and students needed e-modules because they were practical and easy to apply. In addition, e-modules are more interactive and can display videos, images, audio, animations, and quizzes that train students to respond quickly.

Based on the questionnaire results, apart from the need for e-modules as teaching materials, students also needed to be trained in creative thinking skills. The analysis results of the creative thinking ability questionnaire showed that all indicators were classified as low. The percentage score of each component of creative thinking ability from the students' questionnaire is depicted in Table 2.

TABLE 2: The questionnaire analysis results in creative thinking skills.

No	Indicator	Percentage%	Category
1.	Fluency	52.46	Low
2.	Flexibility	44.53	Low
3.	Originality	46.35	Low
4.	Elaboration	51.17	Low

Based on Table 2, several indicators of creative thinking skills, such as fluency, flexibility, originality, and elaboration, were still in the low category, with a percentage value of <55% (Shriki, 2013). According to Munandar (2009), current thinking skills (fluency) include generating ideas, solving problems, providing answers to a problem, and providing many examples or statements related to the current concept. The questionnaire analysis results of students' creative thinking abilities exposed that students rarely gave many ideas and could not think fluently. Likewise, the teacher interview results also stated that students rarely actively gave ideas or solutions to the problems presented.

Then, flexibility thinking covers the ability to produce uniform ideas, where different thinking directions can change ways or approaches. In this study, the questionnaire analysis results of students' creative thinking skills showed that students rarely produced uniform ideas, so they had not been able to change their way of creative thinking. In addition, original thinking comprises the ability to produce new and unique expressions and unorthodox ways of thinking to express new, unique, and unusual statements. In this case, students rarely expressed new ideas or answers other than the others. The teacher interview results also stated that students preferred to synthesize rather than analyze situations. Meanwhile, the ability to detail (elaboration) includes explaining in detail, enriching and developing ideas, and adding and detail in detail a situation to make it more interesting. In this research, students rarely answered questions or problems in

detail. When there were friends who already gave answers, other students tended to be silent and did not add ideas.

Based on the analysis results of the creative thinking ability questionnaire, the e-module design needed by teachers and students is an e-module in which there are learning steps that train students' creative thinking skills. In this regard, according to Made Wena [14], project-based learning provides an opportunity for educators to manage to learn in the classroom by involving project work. Project-based learning is based on constructivism learning theory so that it involves students in developing a collaborative understanding of concepts. Project-based learning activities focus on core concepts and science processes because they encourage and foster a deep understanding of the material while developing higher-order thinking skills [15]. The e-module design with project-based learning also involved students actively participating in deepening the concept without being limited by time, thus training students to learn independently. The student questionnaire results uncovered that students needed e-modules based on project-based learning to study online. Even though they did not meet directly with the teacher, students in groups could discuss with each other and express ideas or answers so that students gain meaningful learning independently.

In addition, complex, open-ended, most controversial, and important issues contexts in everyday life need to be given to training students' creative thinking skills. It agrees with the results of teacher interviews, which revealed that teachers preferred to do learning with sources from the environment. Students also assumed that the pictures or problems presented in the handbook did not make them express many ideas.

Several studies have disclosed that the PjBL learning model can develop students' communication and collaboration skills (Saenab et al., 2017). Other research also illustrates that creative thinking skills provide new ideas by finding many possible answers to a problem, emphasizing quantity, dependence, diversity of answers, and application in problem-solving. [16] found that the project-based learning (PjBL) application accompanied a concept map on redox material for grade X-3 at SMA Negeri Kebakramat in the 2013/2014 school year could increase students' learning activities. Based on several studies, PJBL can improve 21st-century skills.

4. CONCLUSION

The teaching materials used by students were not optimal in training students' creative thinking skills, especially in online learning. Therefore, it is necessary to develop teaching materials in e-modules. The e-modules are developed to facilitate students

learning, both with educators and independent study. In this case, e-modules are teaching materials packaged in their entirety and schematically, with interesting and interactive features. E-modules are also developed based on project-based learning to apply learning steps with context to train students' creative thinking skills.

ACKNOWLEDGEMENT

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