

Research Article

Open-Ended Online Module to Improve Creative Thinking of Elementary School Students

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Abstract. This study aimed to produce a valid and practical open-ended learning-based online module to improve students' creative thinking skills. This was development research which used a 4-D development model consisting of four stages: to define, design, develop, and disseminate. Data were collected through validity and practicality questionnaires. The module that was designed was validated by three experts, while practicality was obtained from the responses of educators and fourth-grade elementary school students. Based on trying out the module, the following conclusions were obtained: 1) the open-ended learning-based online module that was developed met the valid criteria with an average percentage of 90.62%; 2) the module was very practical with an average percentage of 86.11%; 3) students' creative thinking abilities increased, with a percentage increase of 75%. Based on the results of this study, it can be recommended that the open-ended learning-based online module that was developed can be used as an alternative teaching material in teaching mathematics to improve students' creative thinking skills.

Keywords: open-ended learning, online module, mathematics learning

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1. INTRODUCTION

In this competitive era of globalization, every student is required to prepare himself to be able to compete in facing future challenges. For this reason, the learning objectives in the 21st century should have 4C characteristics, namely communication, collaboration, critical thinking and problem solving, creativity and innovation. The ability to think creatively is a cognitive skill to generate and develop new ideas that have been gained before and skills to solve problems from various points of view [1]. Therefore, developing the potential for creative thinking skills needs to start at an early age, both for personal self-realization and for the continuation of the nation's progress.

Students' creative thinking abilities that have not been exploited properly can come from the students themselves, teachers, or the environment. Among the causes of the

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low achievement of creative thinking skills is the unavailability of teaching materials that can support students' creative thinking ability activities. The learning resources used are only teacher's books and students' books of curriculum 13 from the education department [2]. So that learning activities do not support the development of student's creative thinking skills. In the learning process, teachers are generally explaining what they have prepared. Likewise, students enjoy themselves as good listeners of information [3]. As a result, the students only imitate what the teacher does or they only do the exercise based on the examples given. They don't care if they understand or not. This causes students to lack the ability to solve problems with other alternatives. This condition is caused by the fact that they lack the ability of flexibility which is the main component of creative thinking skills.

Referring to efforts to improve creative thinking skills, a learning method and a conducive environment for the development of these abilities are needed. There needs to be a change in the mathematics learning model that involves new efforts such as finding answers (not only memorizing procedures), exploring patterns (not only remembering), formulating conjectures (not only doing exercises) because the learning process is essential to develop the activities and creativity of the students through various interactions and learning experiences [4].

Various efforts can be made to create students' creative thinking skills in learning mathematics. One of them is through learning with an open-ended approach because the approach can provide opportunities for students to play an active role and encourage students' thinking. This means that this approach can be a facility to develop and stimulate students' creative thinking skills. It is also clearly stated that to assist teachers in carrying out learning that can improve students' creative thinking skills is learning with Open Problems [5]. In the learning process, the open-ended approach gives students the flexibility to think actively and creatively in problem-solving and appreciates the diversity of thinking that may arise during the problem-solving process [6]. Open-ended learning makes students think to solve problems using their ability to elaborate the problems they get. By using this learning model, the students are expected to be active and a two-way learning process can occur.

One of the components that support efforts to improve students' creative thinking skills through learning is the use of teaching materials that are tailored to the characteristics and needs of students. Teaching materials or modules that can accommodate creative thinking skills are modules that are supported by appropriate learning models that are able to make students learn effectively [1]. During the COVID-19 pandemic,

where learning is carried out online, the teachers are required to prepare modules that can be implemented in online learning.

Based on the problems that have been raised, it is necessary to develop an open-ended learning-based online module that is valid, practical, effective, and can improve students' creative thinking skills. The online module is a web-based module that can be used as a student learning resource. In this online module, teaching materials are presented along with pictures and videos. The online module is a support for independent learning. Compared to the print module, the advantages of this online module are that it is interactive, which makes it easier to navigate, allows images, audio, video, animation, and has formative tests and quizzes with automatic feedback [7]

2. METHODOLOGY/ MATERIALS

This research was research and development. First, the development of an open-ended learning-based online module was carried out. The two online modules were tried out to see the practicality of the module and students' creative thinking skills after learning using the module.

The research and development model used was the Thiagarajan and Semmel model, namely the 4-D model, namely: 1) defining; 2) designing; 3) development; 4) deployment [8].

At the definition stage, the activities carried out included curriculum analysis, needs analysis, student analysis, and concept analysis. Curriculum analysis aims to determine the main tasks that will be carried out by students. Curriculum analysis consists of an analysis of Core Competencies (KI) and Basic Competencies (KD). This is done to find out the demands of the curriculum, subject matter limitations, and concepts or knowledge that must be understood by students. Needs analysis is one of the important activities in designing learning. This is in line with the design objectives that were developed to help solve the learning needs of students. The needs analysis aims to see the problems found in the observation process, namely the unavailability of learning tools in the form of Open-Ended Learning-Based Modules. Analysis of the characteristics of students is to facilitate language easily understood by students. Characteristics of students who tend to get bored quickly with the use of complicated language make students have difficulty understanding learning materials. With online modules that contain material, images, and the use of simple language, students can understand a material easily.

Concept analysis aims to determine the content and learning materials needed for module development.

After the analysis stage, an open-ended learning-based online mathematics module was designed for fourth-grade elementary school students. The activities carried out are:

- a. Preparing reference books related to material that would be developed into an online module with an open-ended learning-based application.
- b. Compiling the module design that included the module title, the formulation of basic competencies that must be mastered, preparing material topics, and determining the form of evaluation.
- c. Developing a module assessment instrument design to assess the validity of the module. The validity of the module was assessed by educational experts following the education background, namely material experts and learning design experts as well as classroom teachers. The assessment instrument included the accuracy of learning design, the accuracy of material content, and the attractiveness of a module.

This module is a form of teaching material that is packaged comprehensively and systematically, which contains a set of planned learning experiences to help students master certain learning objectives [9].

At this stage, the online module that has been designed was developed. The next stage was the validation and practicality stages. The validation stage was carried out by experts and the practicality stage was carried out by teachers and students.

- a. Validity Stage

The validity test aims to check the conformity of the product with the applicable curriculum, the correctness of the concept, management, form, and appearance of the product. Validity was carried out by experts and education experts under their research fields. Comments, opinions, and suggestions from the validator were used as material to revise the online learning module based on open-ended learning.

- b. Practicality stage

After validation and revision were carried out, the open-ended learning-based online module was tried out in elementary schools. Practicality is the level of how practical the research products are used by teachers. This activity was carried out to find out how beneficial and effective the open-ended learning-based online module can be used by teachers and students. The product try-out was carried out in class IV of SD Negeri 17 Parak Karakah Padang (19 students consisting of 5 females and 14 males).

The type of data in this study was primary data obtained directly from lecturers, teachers, and students. The primary data were: (1) module validation scores from lecturers as validators, (2) questionnaire responses scores by teachers and students; (3) Data of questionnaire scores on students' creative thinking ability.

The data collection instruments used were validation sheets to determine whether the online module designed was valid or not and a practicality questionnaire filled out by teachers and students to see the practicality of the module which included usability, implementation, ease of use of the module, and a questionnaire sheet for students' creative thinking abilities. All data were analyzed using the percentage technique.

3. RESULTS AND DISCUSSIONS

The research was conducted to test the validity and practicality of the developed online module and to see the improvement of students' thinking skills by using the developed online module. The validity was carried out by 3 validators who assessed the validity in terms of didactic, content, language, and appearance while the practicality test was carried out by conducting a tryout at SD Negeri 17 Parak Karakah Padang involving a teacher and student response questionnaire.

After the validation data has been collected, it was analyzed using the percentage formula. The results of the data analysis can be seen in Table 1 below.

TABLE 1: Analysis of Validation Sheet

No	Validator Aspects	Sum of Validity value	Sum of Maximum value	Percentage	Criteria
1.	Didactic, Content	17	20	85%	Valid
2.	Language	19	20	95%	Very Valid
3.	Appearance	14	16	87,5%	Valid
	Sum	58	64	90,62%	Very Valid

Based on Table 1, it can be seen that the results from the validator indicated that the open-ended learning-based online module was categorized as very valid. In detail, the percentage for didactic and content aspects was 85%, so that it was categorized as valid. The percentage for the language aspect was 95% and it was categorized as very valid. The percentage for the appearance aspect was 87.5% and it was categorized as valid.

Furthermore, the practicality data was also analyzed using the percentage formula with the results as shown in table 2 below.

TABLE 2: Analysis of Practicality from Teacher

No	Practicality Aspects	Sum of Practicality value	Sum of Maximum Score	Percentage	Criteria
1.	usability	8	8	100%	Very Practical
2.	Implementation	23	28	82,14%	Practical
	Sum	36	31	86,11%	Practical

Based on the data from Table 2, it can be explained that the percentage of the practicality of the open-ended learning-based online module with materials “two- dimensional shapes” by educators was 86.11% and it was practical. This showed that this open-ended learning-based online module was practically used by educators as a learning resource on “two-dimensional shapes”.

In addition to educators, practicality was also obtained from students, as shown in Table 3 below.

TABLE 3: Analysis of Practicality from Students

No	Practicality Aspect	Sum of Practicality Value	Sum of Maximum score	Percentage	Criteria
1.	Practicality of Module display	137	152	90,13%	Very Practical
2.	Easiness of Module use	417	456	91,48%	Very Practical
	Sum	554	608	91,11%	Very Practical

Based on Table 3, it can be seen that the percentage point for the results of practicality by students in the open-ended learning-based online module was 91.11% which was categorized as very practical. This shows that this open-ended learning-based online module was very practical for educators to use as a learning resource on “two- dimensional shapes”.

Questionnaires of students’ creative thinking skills were given to students before and after the online module tryout was carried out. The results of data analysis were carried out to see the improvement of students’ creative thinking skills. From the results of the analysis, 75% of students experienced an increase in the score of creative thinking skills of at least 5 points. 19% of students experienced an increase of 1-5 points and 6% of students experienced a decrease. Thus, it can be concluded that there is an increase in students’ creative thinking skills through learning using open ended-based online modules.

Based on the results of the research that has been obtained, the validity point of the open-ended learning-based online module from the validator was 90.62% and it was

considered very valid. This is in line with the opinion [9] which states that validation is a process to test the suitability of the module with the competencies that are the learning targets. If the content of the module is appropriate, it means that it is effective for learning the competencies that are the learning targets. Then the module is declared valid. The suitability of the contents of this online module was carried out with the direction and input provided by the validator, resulting in a product in the form of an open-ended learning-based online module. This means that online modules can be used in primary schools.

Through the Ministry of Education and Culture No. 15 of 2020 concerning Guidelines for organizing learning from Home in an Emergency Period for the Spread of Covid-19, the government issued a policy in the form of instructions for the teaching and learning process from home to break the chain of transmission of Covid-19. The data on the practicality of the open-ended learning-based online module was obtained from a questionnaire of educators and students. The analysis of the results of the practicality try-out by the fourth-grade educator of SD Negeri 17 Parak Karakah Padang showed that the score of the open-ended learning-based online module with material “two-dimensional shapes” developed was 86.11% fulfilling practical criteria, while the results of practicality try-out by the fourth-grade students of SD Negeri 17 Parak Karakah Padang showed that the score of the open-ended learning-based online module with material “two-dimensional shapes” developed was 91,11% fulfilling very practical criteria. This was because educators and students conducted online learning using mobile phones so that online modules can be used anywhere and anytime.

4. CONCLUSION AND RECOMMENDATION

Based on the trial data for developing an open-ended learning-based online module that has been carried out, the following conclusions are formulated: 1) the validity of the open-ended learning-based online module that has been developed is categorized as very valid with an average percentage result of 90.62%; 2) The practicality of the open-ended learning-based online module that has been developed and tried out to educators is categorized as very practical with an average percentage of 86.11%; 3) Students' creative thinking ability can be said to increase, with a percentage of increase of 75%. Therefore, it can be concluded that the open-ended learning-based online module is very valid and very practical to use and can improve students' creative thinking skills.

Based on the results of this study, it can be recommended that the open-ended learning-based online module that has been developed can be used as an alternative teaching material in mathematics learning to improve students' creative thinking skills.

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