



Development of an Interactive E-Module (EMODI) Based Creative Problem-Solving Use Articulate Storyline for Probability Material

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Abstract. Technological advances are increasingly rapidly encouraging the replacement of printing media with computers in learning activities. Teachers who only provide printed teaching materials make students less interested in learning. This study aims to produce a product in the form of an interactive e-module (EMODI) based on creative problem-solving using Articulate Storyline that is valid and practical in probability materials. This research is included in Research and Development (R&D) using the 4-D model. The product trial subjects were students of class VIII.4 at SMPN 2 Lubuk Sikaping. Validation sheets and student response questionnaires became instruments in this study. This study produced an interactive e-module (EMODI) which contains: the cover, main menu, instructions, preface, introduction, learning activities, summary, evaluation, answer key, bibliography, and profile menu. Three validators' validation results for content/material eligibility, language, presentation, and graphic feasibility amounted to 90.59%. The results of the student response questionnaire were 88,83%. Thus, interactive e-modules (EMODI) based on creative problem solving using Articulate Storylines in probability material are very valid and very practical to use in learning

Keywords: Interactive E-Module (EMODI), Creative Problem Solving, Articulate Storyline.

1 Introduction

Education in the 21st-century demands technology-based learning so as to improve the quality of an education that will be able to provide information to everyone without exception. With the development of technology the world of education shifted from teaching become learning. Computers, smartphones, and a variety of electronic devices are currently widely used by the public in general. The utilization of electronic devices, such as computers and smartphones plays a major role in changing the need for facilitators in learning activities to become independent learners [1].

Mathematics is a science that cannot be separated from the names of numbers, concepts, formulas, theorems, logic, drawings, and steps in solving a given problem. Mathematics has an important role in developing other sciences and solving problems

in real life. This is the factor that mathematics is one of the most important scientific aspects in the world of education. Seeing this role, it is necessary to develop in the process of learning mathematics which makes students interested in studying this subject.

The development of teaching materials is important for a teacher so that the learning process can be effective, and efficient, and does not deviate from the competencies to be achieved. Teaching materials are tools used in the learning process by teachers so that they can create learning [2]. atmosphere that contains material and is packaged sequentially which requires students to learn. Furthermore, research states that teaching materials are one component of learning that can act as a learning resource. Teaching materials consist of an arrangement of material that is appropriate to the related lesson [3].

Based on the results of preliminary research at SMPN 2 Lubuk Sikaping, students only used library textbooks, especially in learning mathematics. In addition, the number of library books in schools is still limited, this has an impact on the learning process to be less effective. Then, the book cannot be taken home by students due to limited numbers so students do not have guidelines for independent study at home, and explanations of material that are still abstract in nature cause students to feel bored and bored reading it. In addition, most students are not enthusiastic about learning mathematics and the learning outcomes they get are less than optimal.

In learning activities, the teacher has never used teaching materials in the form of modules. This resulted in a lack of learning resources for students and teaching materials for teachers. Therefore, additional teaching material is needed that is used by teachers in learning mathematics so that the expected learning process can be achieved.

One learning model that can increase independence in learning is creative problem-solving, which guides students in solving problems creatively and independently so as to provide a real experience in problem-solving and can grow and train high-level thinking skills including creative thinking skills [4]. Furthermore, states that the learning model creative problem solving is one of the learning models that demands the full role of students in solving their own problems so that students are able to practice independent abilities in solving problems accompanied by developing the ability to think rationally [5]. Revealed that the learning model creative problem solving has several advantages, namely: (1) students become active in the learning process, (2) can foster curiosity, and (3) can train students' thinking skills in solving problems [6].

One of the teaching materials needed to overcome the above problems is a module. According to KBBI, modules are training and teaching, and learning activities that have been studied by students with minimal assistance from supervising teachers, including planning objectives, as well as tools for assessing, measuring student success in completing learning [6]. Print modules during learning make students bored and bored in learning, this can be seen in the learning process, many students are lazy to read modules due to the absence of pictures that attract their attention, causing them to be less active in learning [7]. Furthermore, that printed teaching materials still use abstract and complicated learning and content delivery strategies that make students lazy to read let alone study them [7].

The modules made are said to still not facilitate students in studying material independently, the appearance of modules in printed form with a fairly thick number of pages, presentation of material that is too much and the cost of printing which is not a small cause is less attractive to students. In addition, the use of print modules is only in a certain scope and time [8]. Based on the results of interviews with the school, researchers obtained information that students were allowed to use cell phones in the learning process because school facilities in the form of computer labor cannot be used in every learning process. To make students interested in learning mathematics, additional teaching materials are needed for independent learning both at school and at home that are digital or electronic. The module, which was originally a print learning media, was transformed into an electronic form so it created a new term, namely electronic module or what is known as e-module. Advantage e-modules can carry out two-way communication, can be used in the distance learning process, are sequential and have a clear structure, are friendly, and become a motivation for students in learning [9].

An electronic module is a form of independent teaching material that is presented in an electronic format that contains videos, animations, and audio which are systematically arranged to achieve certain learning objectives [10]. Furthermore, the electronic module is a presentation of independent learning materials arranged sequentially and concisely to achieve the expected learning objectives presented in electronic format, where each learning activity is connected with links as navigation which makes students more interactive with programs [11]. Using this electronic module allows students to study independently anywhere and anytime because they only need supporting media to access electronic modules such as devices or laptops [12].

An electronic module is said to be interactive, characterized by user interaction and being active, for example actively paying attention to pictures, text that varies in color or moves, sound, animation, and even videos and films [13]. Furthermore, e-module Interactive media used in the learning process by teachers and students will have a good impact on strengthening memory about the material presented in the module [14]. E-module interactive which can be accessed via smartphone The user can be said to be a product that is considered quite ideal because it is supported by multi-products (integration of audio-visual videos), high interactivity, and multi-source learning (with an internet network connection) so that it can complement the deficiencies in textbooks [15]. Advantages of e-module interactive, including: (1) Usage of e-module interactive mathematics learning activities can facilitate the learning process for teachers and students; (2) E-module interactive presentation of material in which there are several components, such as images, audio, and video to make learning more interesting and interactive; (3) E-module interactive learning is able to encourage student learning motivation in learning mathematics to experience an increase; (4) E-module interactive can increase student learning independence by providing a fun learning experience; and (5) It is an e-module interactive and also contains interesting practice questions as evaluation material for students [16].

E-module interactive (EMODI) based creative problem solving is made using software to articulate a storyline. Articulate storyline is a tool for e-learning (soft-

ware) which is material in interactive teaching that can build the enthusiasm of students or students in the learning process because it has various practical menus as well as several facilities that can support the learning process to be more enjoyable [17]. Application articulate storyline has several advantages including: applications can be published to Play Store, the display is given interactively, making it easier for students to learn anywhere and anytime, can be accessed offline, and learning media that can be used at home. Development e-module interactive (EMODI) based creation problem solving for probability material in this study using Articulate Storyline. Thus, this research aims to produce interactive teaching materials based on creative problem-solving using Articulate Storyline for valid and practical probability materials.

2 Methods

This research is included in the method of Research and Development (R&D). The development uses a 4-D model which consists of four stages, namely: define, design, develop, and disseminate. The level dissemination was not carried out due to several reasons, namely due to limited costs and implementation time in the deployment of the product being developed.

The level definition has the goal of determining and defining the requirements in the learning process and gathering information related to the product to be developed. The steps in the defining stage are: conducting interviews with mathematics teachers, analyzing student character, and analyzing literature.

Level design (planning) aims to plan e-module interactive (EMODI) based creative problem solving using articulate storyline for probability material. Stage design (design) contains the product manufacturing process that has been planned. The products made have several advantages, including having various publish formats such as LMS, HTML5, articulate storyline online, CD, and Word so that the product results look more comprehensive, interactive, and effective. In addition, the application's articulate storyline can be published to the Play Store, the display is given interactively, making it easier for students to learn anywhere and anytime, can be accessed offline, and learning media can be used at home.

At the level of develop, there are steps in this stage, namely: the validation stage and limited trials to obtain practical data from e-module interactive (EMODI) based creative problem-solving. The product is validated by 3 mathematics lecturers. The product trial subjects consisted of 23 class VIII students at SMPN 2 Lubuk Sikaping. Students are given 4 hours of lessons to use e-module interactive (EMODI) based creative problem-solving.

The instruments of this research consist of a validation sheet and a student response questionnaire. Validation sheet e-module interactive (EMODI) based creative problem solving contains the eligibility of the content/material, language eligibility, presentation feasibility, and graphic feasibility. The student response questionnaire contains aspects of ease of use, efficient learning time, the attractiveness of e-module interactive (EMODI), and benefits from e-module. Statements in the validation sheet and questionnaire use a Likert scale at intervals of 0 to 4.

$$\% = \frac{\text{Sum of All Scores}}{\text{maximum score}} \times 100\% \tag{1}$$

Table 1. Product Validity and Practicality Criteria

Percentage (%)	Validity	Practicality
81 ≤ % ≤ 100	Very Valid	Very Practical
61 ≤ % ≤ 80	Valid	Practical
41 ≤ % ≤ 60	Valid Enough	Practical Enough
21 ≤ % ≤ 40	Less Valid	Less Practical
0 ≤ % ≤ 20	Invalid	Impractical

3 Results and Discussion

At the level of define (definition), conducted interviews with class VIII.4 students of SMPN 2 Lubuk Sikaping, obtained information that students only used library textbooks during the learning process. Then, also conducted interviews with teachers of mathematics class VIII SMPN 2 Lubuk Sikaping to strengthen the opinions of students, that during the learning process, students only relied on library textbooks. Library package books are not allowed to be taken home due to limited numbers so students can only study at school.

In use, e-module interactive (EMODI) students can access e-module interactive (EMODI) using a smartphone so that students are more active and focused on learning mathematics. With the steps of clarifying problems, expressing opinions, selecting and evaluating, and implementing, students are even more motivated in learning mathematics because these steps give freedom to students in solving a problem in mathematics, especially in material probability.

Based on interviews with the school, students are allowed to bring smartphones if needed in the learning process. The school provides limitations with the provisions that smartphones only be used in subjects for which permission is granted. After the learning process is complete, smartphones are given to subject teachers until the end of school hours.

After obtaining the results from the definition stage, the next stage is designing. At the design stage, there are two steps taken. *First*, the step of selection of teaching materials. In this step, probability material came from the 2013 curriculum package book for eighth-grade in the even semester and the internet. Implementation of learning activities uses the procedure of the creative problem-solving learning model. *Second*, product design. Planning e-module interactive (EMODI) using the application articulate storyline where the cover researchers use background taken from an internet site where the colors used are orange, white, and blue. On the cover, the researcher also uses images related to the material, namely image of dice. The following is the type of writing used articulate extrabold with a font size of 27 and 12. Also, one-mode equipped with icon-icon interactive so that students feel interested in using it.

The components of e-modules consist of a cover, preface, table of contents, glossary, introduction, learning activities, answer keys, scoring guidelines, bibliography,

and attachments [19]. An explanation of each menu in the interactive e-module (EMODI) based on the creative problem-solving learning model is as follows. The cover consists of titles, subjects, learning topics, classes, researchers, school logos, curriculum logos, probability material images, and start (Fig. 1).

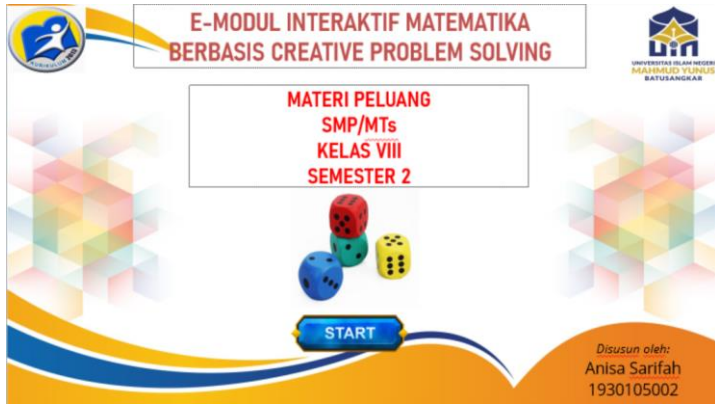


Fig. 1. Cover

The main menu consists of icon several menus, namely instructions, preface, introduction. Learning activity materials, summaries, evaluations, answer keys, bibliography, profile menus, arrow keys, and buttons home (Fig. 2).



Fig. 2. Main Menu

The menu contained in Fig. 2., namely instructions. The help menu consists of icon to go to the available and desired menu options (Fig. 3).

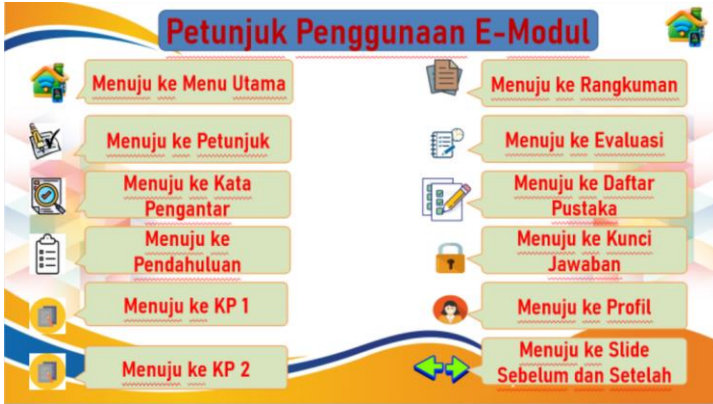


Fig. 3. Instructions Menu E-Modul

The Acknowledgement menu contains information about the role e-module based creative problem-solving in learning (Fig. 4).

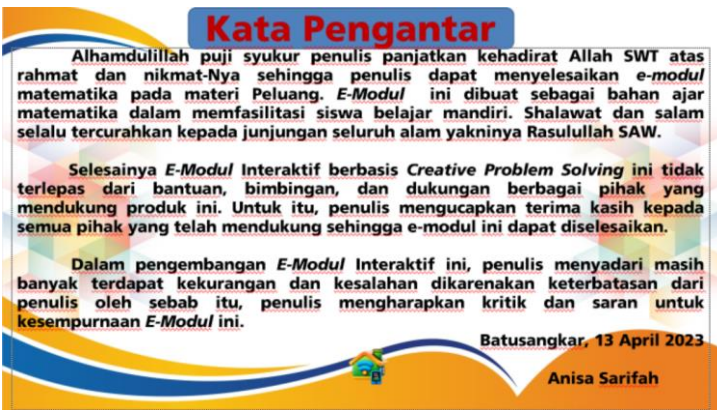


Fig. 4. Acknowledgement Menu

The Introductory menu consists of core competencies, basic competencies, competency achievement indicators, and learning objectives (Fig. 5).

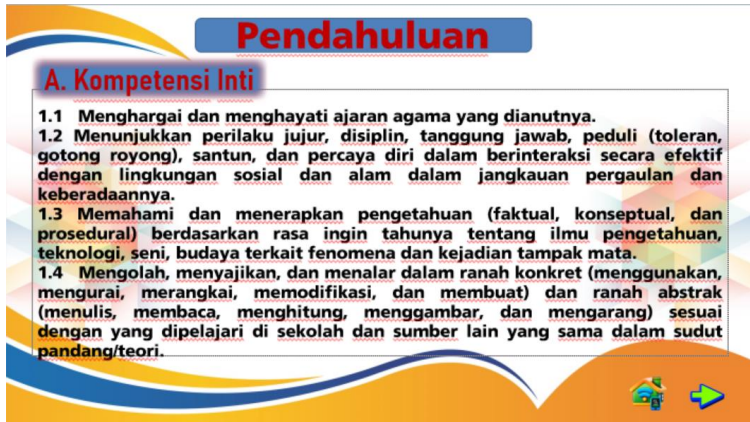


Fig. 5. Introductory Menu

Learning activities consist of two menus, namely learning activities 1 and 2. Learning activities contain experimental activities to determine probability through the steps of the learning model creative problem-solving (Fig. 6).

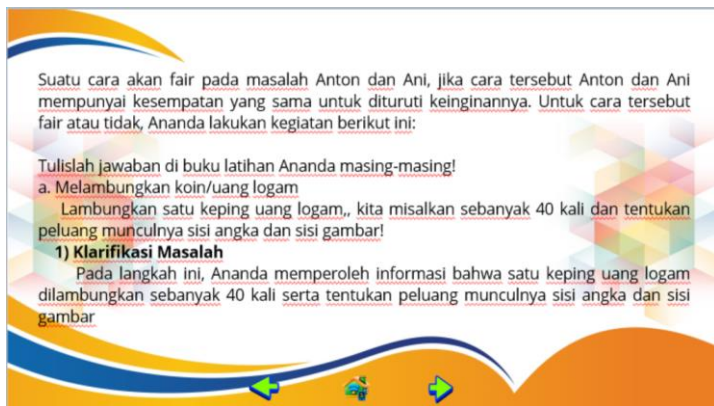


Fig. 6. Example of Student Activities in Learning 1

The Summary menu contains conclusions from the available probability material e-module interactive (EMODI) (Fig. 7).

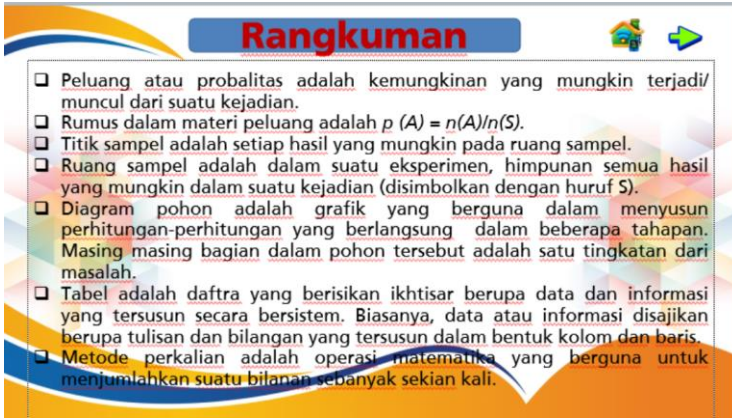


Fig. 7. Summary Menu

The evaluation menu consists of instructions for answering questions and 25 multiple-choice questions that students will work on. The purpose of giving questions is to measure the extent to which students understand the material that has been studied before. Students can see their work at the end of the slide from the evaluation menu and can review the answers they have given (Fig. 8).

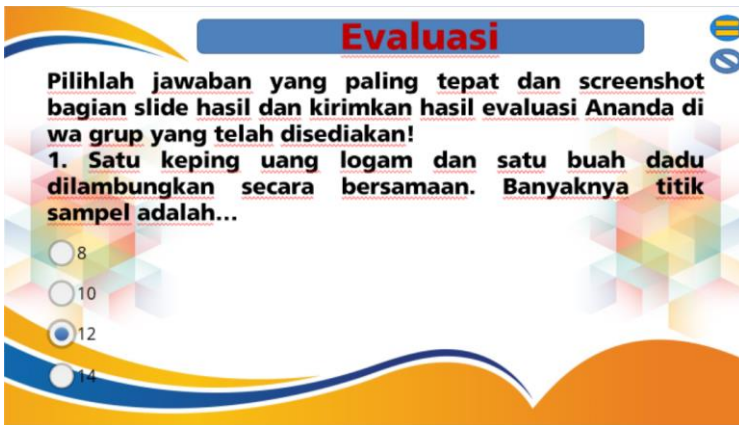


Fig. 8. Evaluation Menu

The answer key menu contains answers to formative tests 1, 2, and evaluation. For the student answer key menu, you can open it at any time, you don't need to answer the questions contained in e-module interactive (EMODI) (Fig. 9).



Fig. 9. Answer Key Menu

The bibliography menu contains books and modules related to probability material for class VIII even semester 2013 curriculum (Fig. 10).



Fig. 10. Bibliography Menu

The next stage is development. Before the e-module is used by students in the learning process on probability material, the e-module interactive (EMODI) must be validated first in order e-module which be suitable to be used as teaching material in schools. Validation sheet e-module in research using a scale Likert, where students give a checklist for each given statement. In this study, the validation sheet e-module (EMODI) was given to three mathematics lecturers at UIN Mahmud Yunus Batangas as validators.

The quality criteria (standards) of a product deemed appropriate as study material, namely aspects of content/material feasibility, language eligibility, presentation feasi-

bility, and graphic feasibility [20]. The feasibility aspect of the content/material consists of three scopes. The first scope is material, such as the completeness, breadth, and depth. The second scope is the accuracy of the data, such as the accuracy of concepts, procedures, illustrations, and facts. Furthermore, the relevance of material, namely: according to student development, educational/learning theory, socio-cultural values, and current conditions. The aspect of language feasibility has points that must be met, namely by standard Indonesian rules and student development. The aspect of the feasibility of the presentation, including the coherence of the concept, has a cover that is characterized by content e-module, according to the student's environment, has interesting and easy-to-understand videos, stimulates student creativity, and has interesting animations. Aspects of graphic feasibility include competitiveness of modules and e-module the other, cover on e-module interactive (EMODI) feature of the content e-module interesting, clear and easy to understand, the layout of the material is arranged neatly and systematically, there is harmony in the color of the writing and pictures, and the type and size of the letters are easy to read. The validation results of the three validators can be seen in Table 2.

Table 2. Validation results e-module interactive (EMODI) based creative problem-solving use articulate storyline

No	Aspect	Validator			Sum	Max Score	%	Category
		1	2	3				
1	Content Eligibility	46	48	39	133	144	92,36	Very Valid
2	Language Eligibility	21	22	22	65	72	90,27	Very Valid
3	Presentation Eligibility	23	24	17	64	72	88,88	Very Valid
4	Graphical Eligibility	27	28	19	74	84	88,09	Very Valid
Average							90,59	Very Valid

Average validation results in e-module interactive (EMODI) based creative problem-solving use articulate storyline of 90.59%. Based on the validation criteria contained in [18], this value is included in the very valid category. In general e-module interactive (EMODI) based creative problem-solving use articulate storyline already meet the quality criteria of a product.

From the validation results above, e-module interactive (EMODI) is suitable for use by improving some of the suggestions given by the validator, namely: The dice images on the cover are equated in length and width. In the main menu, the material is divided into two, namely for Learning Activities 1 and Learning Activities 2, adjusting the way of accompanying students in solving problems with the activities carried out by students, and adding the use of arrows to the user manual menu e-module interactive.

After e-module interactive (EMODI) based creative problem solving used articulate storyline valid, a limited trial was carried out at SMPN 2 Lubuk Sikaping to find out its practicality. VIII.4 class students use e-module interactive (EMODI) that has been designed. Next, students filled out the response questionnaire that had been pro-

vided. The results of student responses to practicality e-module interactive (EMODI) based creative problem solving using articulate storyline developed can be seen in Table 3.

Table 3. Practicality results from e-module interactive (EMODI) based creative problem-solving use articulate storyline by students

No	Indicator	Score	%	Criteria
1	User convenience	303	90,17	Very Practical
2	Efficiency of learning time	371	88,33	Very Practical
3	The attractiveness of interactive e-modules	516	87,07	Very Practical
4	Benefit	377	89,76	Very Practical
Average			88,83	Very Practical

Based on Table 3 students gave very practical responses to ease of use, the efficiency of learning time, the attractiveness of e-module interactive, and usefulness. Overall, students stated that e-module interactive (EMODI) based creative problem-solving use articulate storyline very practical to use in learning.

It can be seen from the student response questionnaire that students agree and strongly agree in its use of e-module interactive (EMODI) according to the statement given. Each percentage obtained shows that e-module interactive (EMODI) based creative problem solving developed is very practical to use in learning. Besides that, e-module Interactive learning (EMODI) can be an independent teaching material whether there is a teacher or not. E-module-based creative problem-solving can meet the practical perspective of students and can be used as teaching materials by students to study at school or study independently [19].

Based on the presentation of the research results above, e-module interactive (EMODI) based creative problem solving uses an articulate storyline feasible and practical to use in the learning process both at school and at home. In addition, students can study independently anywhere and at any time with access to smartphone and laptops.

4 Conclusion

This research produces interactive teaching materials in the form of e-module interactive (EMODI) based creative problem-solving use articulate storyline already valid and very practically used in learning probability material. In addition, students can use EMODI with smartphone and laptops respectively.

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