

Validity of Problem-Based Learning Media Assisted by Kodular To Improve Problem Solving Abilities and Mathematical Critical Thinking Abilities of Junior High School Students

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Abstract: The aim of this research is to describe the results of validity tests by experts and practitioners regarding junior high school statistics learning media. The background to media development is the school's need for interactive learning media that can be accessed via smartphone to improve students' problem-solving and critical thinking abilities. The research method used was development using the ADDIE model and carried out until the media validation stage for experts and practitioners. The data collection instrument uses a validation sheet. The data analysis refers to suggestions and improvements provided by the validator. The research results show that the statistics learning media developed using the Kodular Application meets the very valid category from practitioners and experts. Improvements to the media refer to improvements to the title page, writing errors and clarity of personal identity information.

Keywords: Interactive Learning Media, Kodular Applications, Validity.

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A. INTRODUCTION

Mathematics learning media is important to use in learning. Learning media are tools used to convey information and learning messages to students. With the presence of media in the mathematics learning process, it is hoped that it can support teachers in increasing students' understanding of learning. (Ompusunggu, 2022). The use of learning media aims to convey messages more clearly, overcome limitations of space, time and senses, as well as increase the smoothness of the learning process, and other goals (Sudianto, 2021). Therefore, it is recommended for teachers to use media in every learning session so that the goals to be achieved can be realized (Ompusunggu, 2022).

Mathematics learning media, especially for junior high school students, is very diverse. Research carried out by (Purwanto & Pamungkas, 2020) developing learning media using *Adobe Flash Professional CS6* on class VII triangles and quadrilaterals. The final result of this media development is a mathematics learning media application packaged in *compact disc* (CD) form. Other research was carried out by (Syofni, 2019) developing mathematics learning media on the volume of space material. The final result of developing mathematics learning media is in the form of teaching aids. The final results of the development of learning media in the form of an Android application were carried out (Hamdani & Priatna, 2021) on statistics material,

(Fina Fitriya & Faizah, 2021)trigonometry material, and (Zakiy, 2019)spatial construction material.

It is important to develop mathematics learning media. In several learning activities, learning media have been used, but to achieve student success in mastering the material better, teachers need to develop learning media that is appropriate to the material and student characteristics. Because each group of students taught has different characteristics, teachers need to innovate in developing learning media. Therefore, the importance of developing learning media will be one of the determining factors for the success of learning objectives(Utami, 2017)

One application that can be used to develop mathematics learning media is Kodular. Kodular is an online platform that provides tools for creating Android applications using a drag-and-drop block programming approach (Kasma & Kurniadi, 2022). Kodular's main feature is programming blocks, which allow users to create Android applications without needing to write program code manually (Kholifah & Imansari, 2022). The advantages (Kodular, 2019) of codular are a) No coding. Just drag n' drop several components and combine them with several blocks. b) Cloud Based, and hosted on Google Cloud Platform. c) Official and integrated Material Design, providing a clean, user-friendly and intuitive UI d) Has a strong server infrastructure that provides seamless services. e) Live Testing in real-time directly using on the user's device. f) Supports all types of phones and tablets starting from Android 4.4 KitKat! g) Using the features provided is very simple h) Provides more than 185+ components. i) Has monetization options, such as advertising or in-app purchases, that allow users to profit from the applications created. j) Supports a total of 18 languages. k) Provides a Push Notification component supported by OneSignal. l) Can download and import any application project or screen using .aia and .ais file formats. m) provides multiple login options (Kodular, Google, GitHub, Twitter). n) Can be accessed for free

The Kodular application has been developed as a mathematics learning medium. For example, in this application research it is used on relationship and function material, (Rizqiyani et al., 2022)this application research is focused on improving the mathematical literacy skills of junior high school students and (Fitriani et al., 2022)this application research is used on flat-sided geometric material. The difference between this research and what has been done is the use of the Kodular application as a mathematics learning medium for statistical material. This research aims to describe mathematics learning media developed using the Kodular Application and the results of validation testing by validators. The contribution of this research to mathematics learning is that it provides an overview of the development of mathematics learning media to improve students' problem-solving abilities.

B. METHOD

The method used in this research is *Research and Development*. Research and Development (R&D) is a series of processes or steps used to create new products or improve existing products. (Okpatrioka, 2023). The research model used in this research is the ADDIE development model, namely development research which consists of 5 stages, namely *Analysis*,

Design, Development, Implementation and Evaluation. The stages of the ADDIE model can be seen in the following image.

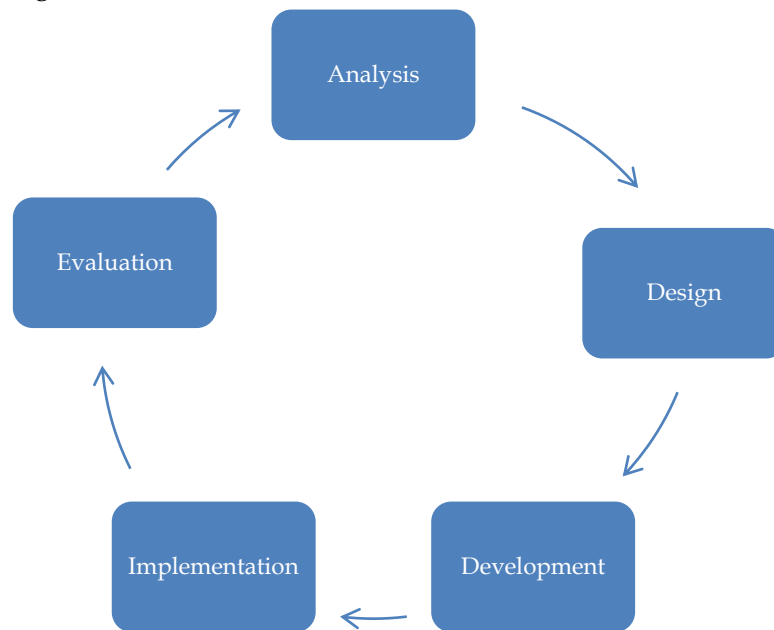


Figure 1. ADDIE Model

The first stage of the ADDIE development model is analysis. At this stage the researcher carried out a needs analysis. The needs analysis was carried out through interviews with one of the mathematics subject teachers at SMP Sepuluh Nopember Sidoarjo whose address is Jalan Raya, Bedrek, Siwalanpanji, Buduran, Sidoarjo. This needs analysis is carried out to find out what media has been used previously and what kind of media is needed. The second stage of the ADDIE development model is design. At this stage the researcher begins to develop the design of each application page. The application pages created include the title page, lessons, practice questions, quizzes, instructions, and the creator's identity. After compiling the design of each page, the researcher then carried out the next stage, namely development. At this stage, the researcher accesses the modular web page to create learning media based on the design created in the previous stage. The final result of the Kodular website is an Android application. The next stage is implementation. At this stage, the researcher validated the learning media with 2 validators, namely the teacher and lecturer. This validation was carried out using a validation questionnaire instrument. After the learning media is validated, the next stage is evaluation. The learning media was revised again according to the suggestions given by the validator. The instrument used in this research is a questionnaire with the measurement scale used is a Likert scale. The questionnaire was given to one of the lecturers in their field and the subject teacher as a validator to be used as an instrument for product feasibility in using the learning media being developed, with the type of answer used being in the form of a check list (√). The answer score given for the questionnaire is 1-5. The components assessed are as follows.

Table 1. Validation Questionnaire Components

No	Component	Item
1	Appearance	12
2	Content and Presentation	10
3	Language	3
Total		25

After the data was obtained, the researcher calculated the total score from the validation questionnaire and then converted it into a feasibility percentage using the formula (Hasana et al., 2021; Windawati & Koeswanti, 2021):

$$\text{Eligibility Percentage\%} = \frac{\text{Total Score}}{\text{Maximum Score}} \times 100\% \quad (1)$$

After the percentage value is obtained, the value is categorized according to the (Hasana et al., 2021; Windawati & Koeswanti, 2021) following eligibility table:

Table 2. Eligibility Criteria

No.	Percentage	Validity Level
1.	81% - 100%	Very Valid
2.	61% - 80%	Valid
3.	41% - 60%	Fairly Valid
4.	21% - 40%	Less Valid
5.	1% - 20%	Very Invalid

C. RESULTS AND DISCUSSION

1. Learning Media Display

The result of developing problem-based learning media using a modular website is an Android application. The appearance of the learning media is presented in the following images.

**Figure 2.** Media Title Page**Figure 3.** Instructions Page



Figure 4. Main menu



Figure 5. Learning menu options



Figure 6. Page of Learning Achievements and Learning Objectives



Figure 7. Page stage 1 - orienting students to the problem,



Figure 8. Page stage 2 – organizing students to study



Figure 9. Page stage 3 – guiding individual and group investigations

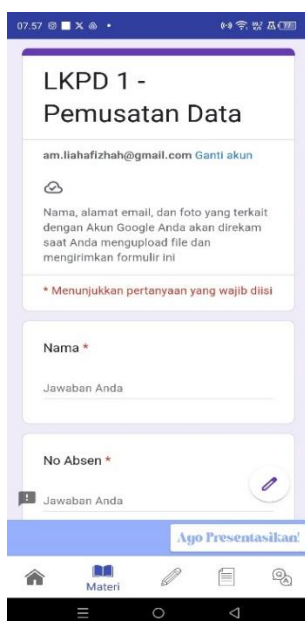


Figure 10. Page for collecting work results

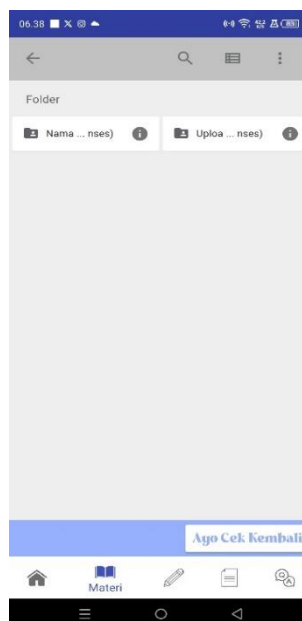


Figure 11. Stage 4 page - developing and presenting results

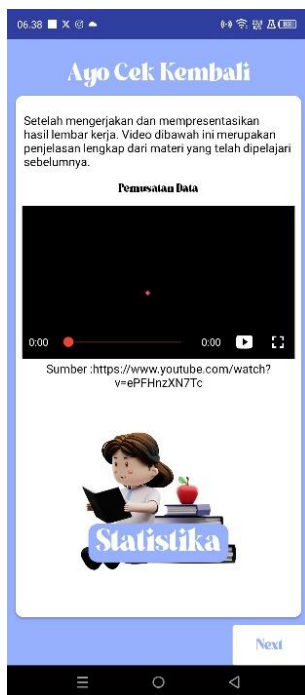


Figure 12. Page stage 5 – analyzing and evaluating the problem solving process

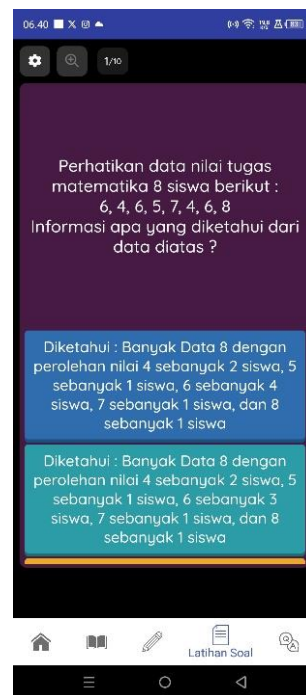


Figure 13. Practice question page



Figure 14. Quiz page



Figure 15. Identity page

The learning media developed implements problem-based learning methods. On the main page there are 4 button options, namely Come on, learn, practice questions, quiz and about me. Instruction pages can be found in the navigation buttons and on the second page after students open the learning media. When students access the let's learn button. A short video is presented regarding an introduction to statistics in general. Students access the play

button and watch the short video. After students have finished watching the video, students access the start button. The next page contains 6 menu options, namely learning outcomes and objectives, stage 1 – orienting students to the problem, stage 2 – organizing students to learn, stage 3 – guiding individual and group investigations, stage 4 – developing and presenting results and stage 5 – analyzing and evaluate the problem solving process.

First of all, students access the learning outcomes and objectives button. It is hoped that students will read first regarding the learning outcomes and objectives of statistics material. Then students access the stage 1 button – orienting students to the problem. On this page, data regarding the mathematics test scores of 15 students is presented in the form of a diagram. Students are asked to record any information on the problem on a piece of paper. After 5 minutes, the page will change to the next page, namely stage 2 – organizing students to study. On this page, an initial introduction to the concepts of mode, median and mean is presented. Students can read the material on the page then access the play button to watch a short video regarding the introduction of the mode, median and mean. Then students are asked to access the stage 3 button – guiding individual and group investigations. On this page, LKPD is presented related to the problems that have been observed on the stage 1 page - orienting students to the problem. Students answer the questions and work on the LKPD according to the instructions in each section. Students are asked to screenshot all the answers on the LKPD to be collected via the Google form on the next page. This collection aims to make it easier for students to present their answers at stage 4 - developing and presenting results. On the stage 4 page - developing and presenting results, a Google Drive display of the response results from the Google form that has been collected previously is presented. One student can present the results while the other students can observe via their respective smartphones. Then on the next page, namely page 5 - analyzing and evaluating the problem solving process, a complete video explanation regarding the mode, median and mean is presented. Students access the play button and observe the video for further understanding regarding statistics, namely mode, median and mean. After students have completed all the learning stages, students can access the practice question and quiz pages.

2. Learning media validation results

a. Validation results by expert validators

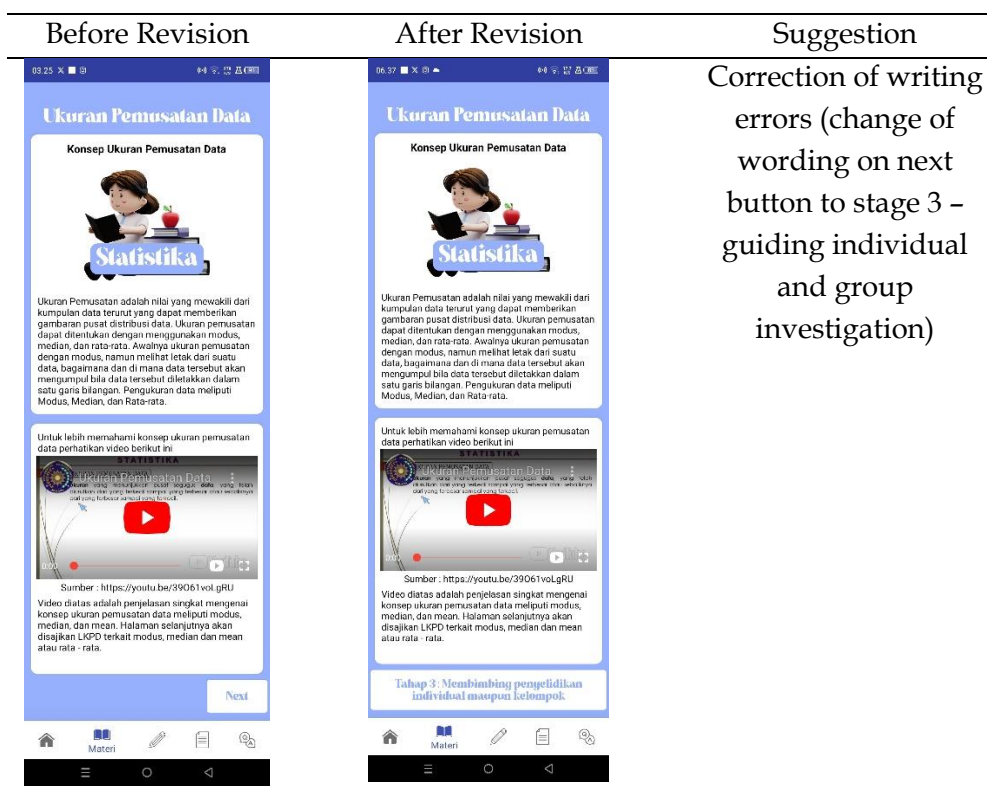
Validation is carried out by expert validators using a validation questionnaire. There are 3 components to the validation questionnaire, namely appearance, content and presentation, and language components with a total of 25 questions. The results of the validation are presented in the following table.

Table 3. The results of the validation are presented

No	Component	Percentage
1	Appearance	95%
2	Content and Presentation	78%
3	Language	80%
	Average	84,3%

The suggestions from experts as well as views before and after revision are as follows

Before Revision	After Revision	Suggestion
		<p>Title page improvements (no title/class/material yet)</p>
		<p>Personal biodata is unclear</p>





b. Validation results by practitioner validators

Validation is carried out by practitioner validators using validation questionnaires. There are 3 components to the validation questionnaire, namely appearance, content and presentation, and language components with a total of 25 questions. The results of the validation are presented in the following table.

Table 4. The results of the validation are presented

No	Component	Percentage
1	Appearance	95%
2	Content and Presentation	96%
3	Language	86.6%
Average		92.5%

The suggestions from practitioners as well as the appearance before and after revision are as follows:

Before Revision	After Revision	Suggestion
		<p>Correction of writing errors (Social arithmetic becomes Statistics)</p>

Present the results of the media development carried out and the validation results, then link them to previous research. Based on the explanation above, validation is carried out by two validators, namely expert validators and practitioner validators. Validation was carried out using a validation questionnaire which contained 3 components, namely appearance, content and presentation, and language components with a total of 25 questions. The results of validation by experts show that the display components achieve a percentage of 95%, the content and presentation components achieved a percentage of 78% and the language component achieved a percentage of 80%. With an average of 84.3% then validation by experts gets a category very valid. The suggestions from expert validators are improving the title page by adding title, material and class, improving identity clarity, and improving the writing of the next button to become a stage 3 button - guiding individual and group investigations. Meanwhile, the results of validation by practitioners show that the display component achieved a percentage of 95%, the content and presentation components achieved a percentage of 96% and the language component achieved a percentage of 86.6%. With an average of 92.5%, validation by experts received the very best category. valid. The suggestion from the validator practitioner is to correct the error in writing the word "Social Arithmetics" to "Statistics". Other learning media created using the modular website also received the very valid or valid category. Like research conducted by (Arnaz et al., 2022). This research developed an android application with the help of a code on relations and functions material. The validation results from this media achieved a percentage of 91.67% with a very valid category. Other research was

conducted by (Rizqiyani et al., 2022). This research developed an e-module in the form of an Android application with the help of the Pythagorean theorem code. The validation results from this media achieved a percentage of 76% in the valid category.

D. CONCLUSIONS AND SUGGESTIONS

Based on the results of the analysis and discussion above, it can be concluded that 1) The problem-based learning media developed has several display pages, namely the title page, learning, practice questions, quizzes, instructions, and the identity of the creator. 2) The final result of the learning media is an Android application. 3) Validation by experts gets a category very valid category with a percentage 84,3% and validation by practitioners received a very valid category with a percentage of 92.5%. The disadvantage of the problem-based learning media that has been developed is dependence on the internet network. For this reason, it is recommended that future researchers develop problem-based learning media that can be accessed in any situation.

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