Android-Based Digital Module Development using Kodular to Teach Geometry at University

Yessi Kartika[1*], Rahmi Hayati[1], Husnidar[1], Rahmi Wahyuni[1], Asrul Karim[2], and Fachrurrazi[2]
[1] Department of Mathematics Education, Universitas Almuslim, Bireuen, Indonesia
[2]Department of Elementary School Teacher Education, Universitas Almuslim, Bireuen, Indonesia
yessikartika@gmail.com

Abstract. The purpose of this study is to produce digital modules on android-based geometry courses using Kodular that are valid and can be used in the learning process. The research method used is Research and Development (R&D) which uses the ADDIE model consisting of steps of analysis, design, development, implementation, and evaluation. Validity tests have been carried out by media experts and material experts. The results of media validity was 94% with a very valid category and material validity is 80% with a valid category. Meanwhile, for the usability digital module using the System Usability Scale (SUS) questionnaire given to 15 students from one of the universities in Aceh who were taking Geometry courses. The usability result shows 83.5%, which means that the digital module of the Geometry course meets the excellent criteria. Therefore, it can be concluded that the digital module of Android-based Geometry courses using Kodular is valid and can be used as a learning medium in Geometry courses at the university level.

Keywords: Android, Digital Module, Kodular, Geometry

1 Introduction

Today, technological advancements have changed the way we interact in our lives significantly. Information and Communication Technology (ICT) has become part of learning in education. Therefore, the integration of technology as a learning aid can increase student interest in the learning process. Teaching staff have the ability to choose and use the right teaching materials. With the integration of technology in the classroom and learning media will make learning easier. [1]. Learning objectives will be achieved faster and more effectively [2]. Increase students' interest in learning [3],[4].

Using a digital module is used as a learning resource. It can help students learn independently and use various online platforms, make learning easier, and improve learning outcomes. Learning through digital modules is an easier way to improve the quality of learning [5]. Digital Module or electronic book is a textbook that is converted into a digital format that contains digital information in the form of text, images, even interactive animations is also more practical because it can be accessed through smartphones and laptops and computers. The material is also easy to understand, which makes students interested and happy to read it [6].

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The development of digital modules on learning with various topics has been carried out a lot [7]],[8],[9] However, there has been no research related to digital modules that contain full features according to learning needs. The developed digital modules contain only learning materials, or games without incorporating other important learning components such as assignments, examples and discussions, quizzes, and contextual learning videos that can be easily understood by students so that fun learning objectives can be achieved. research conducted by Yuniarti [10] shows that the development of smartphone-based interactive e-module learning media on 21st Century Skill-Oriented Indefinite Integral Material gets effectiveness results of 70% or high category

This is in line with the ultimate research [11], revealing that the use of Kodular assisted e-modules due diligence results using SUS obtained a score of 71 or categorized as acceptable in learning classes and entered into good rankings.

Kodular is a website that can design Android apps without the need to enter program code. Kodular can be run with the concept of drag and drop block programming. In addition, Kodular has a storage function, which allows storing and downloading data as needed. Kodular code can be customized with themes through a GUI interface to make the application we create more attractive. With unique learning media, students enter a comfortable and fun world of learning. Digital modules created using Kodular can transfer information more efficiently fromprint-based books to technology-based books, so students can learn independently both at school and at home. Easy-to-understand teaching material texts containing color images, learning videos are contextual with interesting animations. It is also based on everyday life, namely s, sample questions equipped with detailed discussions, online-based quizzes and educational game features for the implementation of learning in the classroom digitally.

The material that is often considered difficult in geometry courses is geometry slices. Students often incorrectly determine the steps in doing the problem. This is usually due to students not being careful in answering questions [12]. Geometry can not only be learned in class, but can also be learned through various activities [13] To overcome this, a digital module is needed as a learning resource, so that students can learn independently and can repeat Geometry material at their own pace and ability repeatedly until students understand the steps in answering questions correctly.

2 Method

This research is a type of research and development (R&D), which is a research process used to develop a product that is tested valid and can be used and useful in education, especially to support learning objectives. The product resulting from this research is a digital module. The model used is ADDIE (Analysis, Design, Development, Implementation, Evaluation) [14]. produce learning media. The participants of this study were students of the second semester of Mathematics Education at Almuslim University located in Bireuen Regency, Aceh Province. ADDIE development is cyclical, limited by one cycle. The complete product development procedure in this study can be explained in the Fig. 1.:

Fig. 1. Rnd

The Research Instrument consists of the following questionnaire sheets, namely media feasibility questionnaires filled out by material expert validators, and media feasibility questionnaires filled out by media expert validators. Questionnaires are arranged according to the Likert scale (1-5) [15]. The System Usability Scale (SUS) questionnaire filled out by students as users of digital modules designed with the aim of measuring the reusability of software for industrial purposes [16]

After obtaining the data from the media feasibility test, the next step is data analysis. The questions obtained from the validation sheet will be analyzed using percentage analysis techniques. The data processing formula that has been assessed by the validator is as follows:

$$P = \frac{X_i}{X} \quad (1)$$

Information
P = percentage value
Xi= number of scores given by validators
for each aspect
X= maximum score for each criterion

Next, validity criteria are used to convert all assessment percentage data into descriptive quantitative data. The quality criteria for digital module learning media can be seen in Table 1 below.

Table 1. Digital module quality criteria

No	Value	Criterion	Information
1	81-100%	Highly Valid	Very Valid, No revision
2	61-80%	Valid	Valid, not revised
3	41-60%	Quite Valid	Invalid, revision
4	40%	Invalid	Invalid, Revision

So Usability can be interpreted as a measure of effectiveness, efficiency and satisfaction of certain users in using a particular product to achieve. One tool to measure usability is the System Usability Scale (SUS) proposed by J Brooke. Table 2 is a list of 10 statements in the SUS questionnaire [18].

Table 2 SUS questionnaire items

Not	**SUS item**
1	I want to use this digital module again
2	This digital module is very difficult for me to use
3	This digital module is easy for me to use
4	To use this digital Module I need the help of others
5	This feature of the Digital Module is easy to operate
6	I'm sure others will find it easy to use this module in learning
7	I'm sure others easily understand how to use this digital Module
8	The use of this digital module is confusing
9	there is no difficulty in using this Digital Module

10	Before using this digital Module I familiarize myself first

SUS has 10 questions on a Likert scale, with scores ranging from one to five, each of which indicates a value of 1 for "Strongly Disagree", to 5 for "Strongly Agree". Each question item has a score from 0 to 4. For odd-numbered items (1,3,5,7,9), the score of the item obtained is subtracted by 1. As for evenly numbered items (2,4,6,8,10), the score is 5 minus the item value. To analyze the SUS questionnaire data, equations are used (1). UPres = Product Usability by respondents; N1+N2+N3...+N10 = Statement score number 1 to 10.

$$UPres = (N1+N2+N3...+N10) \text{ X } 2.5 \quad (2)$$

The result of the SUS assessment is from 0 to 100, which can be interpreted increasingly.The high score obtained indicates that the function is easier to use [17]. Based on the instrument SUS provides more accurate and quality test results than some other instruments as described [18][19]. Student response criteria is presented at Fig. 2.

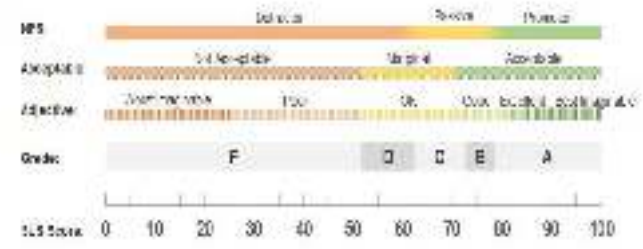

Fig. 2. Interpretation of digital module usability criteria

3 Results and Discussion

The stages of digital module development can be described as follows: The first stage of analysis. This stage is carried out by analyzing the feasibility and needs of digital modules of android-based geometry courses using Kodular. In the second stage, (design) is carried out with *Focus Group Discussion* (FGD) of mathematics education lecturers FKIP Almuslim to determine the appropriate material to be applied in learning, and discuss with media experts and material experts to get technology-based digital modules. Third, the development stage includes the design of digital modules using Kodular. preparation of materials, content, and videos related to the material. Making videos and writing material on products that are tailored to the needs of carrying out learning activities.

After the digital module of the Geometry course is prepared using Kodular, the next stage is to conduct a validation test by media experts and material experts. Media validation contains several important aspects of the digital module developed, including screen display, ease of use, consistency, benefits, and graphics Media validity assessment data can be seen in Table 2.

Table 2. Assessment of learning media exerts

No.	Aspects	Number of Scores	Percentage
1.	Visual display of the screen	21	80%
2.	Ease of Use	8	77%

3.	Consistency	10	78%
4.	Benefit	19	77%
5.	Of	9	78%
	Grand Total		94%

Based on Table 2 above, the average value of the validity test is 94% and is categorized as very valid.

The results of the material expert's assessment of digital modules using Android-based Kodular in the Geometry course can be seen in Table 3.

Table 3. Expert assesmen of the material

No	**Aspects**	**Number of Scores**	**Percentage**
1.	Content Quality	33	80%
2.	Grammar	15	90%
3.	Material Discussion	14	70%
	Grand Total		80 %

Based on the results of the validation assessment from material experts, it obtained 80% with valid categories. It can be concluded that the digital module uses the android-based Kodular.

The digital module of the Geometry course that has been declared valid, will then be implemented in the second semester students, as presented at Fig. 3.

Fig. 3. Design of digital module of Geometry course

Fig. 4. Design of learning videos on digital module

The Evaluation stage is to analyze the extent to which the implementation of digital modules can affect student learning outcomes. After learning using the digital module, students fill out the SUS questionnaire to measure the usability of the learning media.

Table 4. Students response to usability media based on SUS

Respondent	P 1	P 2	P 3	P 4	P 5	P 6	P 7	P 8	P 9	P 10	SUS core
1	5	2	5	2	5	1	5	2	5	1	92.5
2	4	1	4	2	4	1	4	1	4	2	82.5
3	5	2	4	1	5	1	5	2	5	2	90
4	5	1	5	1	4	5	5	2	5	2	80
5	5	1	4	1	5	1	4	2	4	2	90
6	4	2	4	2	1	1	2	1	4	1	70
7	4	1	5	2	1	1	5	1	5	1	85
8	5	3	5	1	4	2	4	1	5	1	85
9	4	2	4	3	3	2	4	1	5	1	75
10	5	1	4	1	4	2	4	1	4	1	87.5
11	4	1	5	1	5	2	4	1	5	2	90
12	4	1	5	1	1	1	2	1	5	1	80
13	4	2	4	2	4	2	4	1	4	1	82.5
14	4	1	4	1	2	2	4	1	5	2	82.5
15	4	1	4	2	4	4	4	1	5	1	80
											83.5

Table 4 shows the average reusability value of Android-based digital modules using Kodular obtained from 15 respondents was 83.5%. Based on Figure 4, student responses to Usability are in the Excellent category. This shows this digital module is acceptable and easy to use.

Using digital module in Android-based Geometry courses that have been developed has advantages because teaching materials can be held through Android. Attractive color displays and animations are very helpful for the learning process. as Febrianti [20] said by using digital modules, all learning materials will be easy to learn and can be taken anywhere and anywhere so that it becomes more practical. Students can learn independently [21].

The Excellent category of the SUS 83.5% Usability Scale (SUS) system questionnaire can mean that the general acceptance rate of digital modules by students can be accepted and can use the module well. Therefore, to facilitate the understanding of learning material in the Geometry course, this digital module can be recommended to other people or the public

4 Conclusion

Based on the results of research on the digital module of the Android-based Geometry course with the help of Kodular, it can be concluded that the digital module that has been developed has been validated by media experts with an assessment percentage of 90% and is included in the very valid category. The results of the material expert's assessment received an assessment of 80% and were included in the valid category. After the learning media product was used, a usability evaluation using SUS obtained an assessment result of 83.5% meeting the excellent criteria. From the results of the Usability test obtained, it can be concluded that the digital module in the Geometry course gets acceptance by second semester students as users.

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