UJME 10 (3) 2021: 244-250
UNNES JOURNAL OF MATHEMATICS EDUCATION
https://journal.unnes.ac.id/sju/index.php/ujme/
ISSN: 2252-6927 (print); 2460-5840 (online)

# Development of android-based interactive learning media on statistics

A. Aziz[a,*], Amidi[b]

[a] *Mathematics Department, FMIPA, Universitas Negeri Semarang, Indonesia*
[b] *Mathematics Department, FMIPA, Universitas Negeri Semarang, Indonesia*

** E-mail address: abdulazizahwan97@students.unnes.ac.id*

ARTICLE INFO

*Article history:*
Received 4 Oktober 2021
Received in revised form 25 Oktober 2021
Published 30 November 2021

Keywords:
Development; Media; Interactive; Android; Statistics

Abstract

The purpose of this study is to develop and test the feasibility of android-based interactive learning media based on the feasibility of the validator's assessment from the material side and the media side. This type of research is R&D (research and development). The procedure used in this research and development is the procedure from Borg & Gall, which has been modified by the Puslitjaknov Team using three stages out of 5 stages, namely conducting a needs analysis to be developed developing initial products, and product validation and revision. The product of this research was assessed qualitatively, namely on a 5-point scale ranging from 1 to 5. So, the Likert scale was used for evaluation. This study resulted in an android-based interactive learning media that has been declared valid and feasible to be used as mathematics learning media by five validators from the material side who obtained an average score of 3.75 (good category) and five validators from the media side with a score an average of 3.64 (good category) with each maximum score of eligibility is 5. So, it can be concluded that the android-based interactive learning media developed is valid and feasible to be used as a mathematics learning media.



## 1. Introduction

One of the subjects that students in mathematics must study. Mathematics has a huge role in life, especially in the development of science and technology. In addition, mathematics has an essential role in the field of education. This can be seen from the mathematics taught at the elementary, secondary, and higher education levels. Mathematics is taught to students to equip students with the ability to think logically, critically, analytically, systematically, and creatively and work together with others. Students are required to achieve the competencies that the curriculum has determined in studying mathematics.

The Program for International Student Assessment (PISA) is a triennial survey conducted to assess the extent to which students aged 15 years near the end of compulsory education have acquired the critical knowledge and skills essential for full participation in modern society. PISA is organized by the Organization for Economic Cooperation and Development or the Organization for Economic Cooperation and Development (OECD), attended by 78 developed and developing countries. The 2018 PISA survey focused on reading, math, and science literacy. The test consists of multiple-choice questions and questions that require students to construct their responses. The questions are arranged in groups based on sections describing real-life situations.

Indonesia's math performance at PISA 2018 was ranked 72 out of 78 participating countries with 379. The average math achievement of Indonesian participants at PISA 2018 decreased from the average math achievement of Indonesian participants at PISA 2015, which was 386 with a rank of 63 of the 70 participating countries. The average achievement of Indonesian mathematics at PISA 2018 is at level 1 of 6 levels of mathematics scores, and Indonesia's mathematics score at PISA 2018 is still far from the average

*To cite this article:*
Aziz, A. & Amidi (2021). Development of Android-based Interactive Learning Media on Statistics. *Unnes Journal of Mathematics Education*, 10(3), 244-250. doi: 10.15294/ujme.v10i3.54145

mathematics score of PISA 2018, which is 489. At level 1, students can answer questions that involve a context that is already known, where all relevant information is present, and the questions are clearly defined. They can identify information and perform routine procedures according to direct instructions in explicit situations. They can always perform obvious actions and follow given stimuli (OECD, 2019a, p. 92).

In addition, based on the Educational Assessment Center (Puspendik) of the Ministry of Education and Culture, the average achievement of the National Examination scores of Junior High School level students in 2019 at the national level still has a Computer-Based National Examination or Paper and Pencil-Based National Examination below standard. The average result of the 2019 SMP Mathematics UN only reached 46 points. Meanwhile, the competency standard that is set is 55. So, it can be seen that the average score of the 2019 Junior High School Mathematics National Examination is still below the competency standard that has been set.

One of the goals of learning mathematics is the ability to represent. The importance of mathematical representation skills in mathematics learning was also conveyed by NCTM or the National Council of Teacher Mathematics. NCTM (2000) includes representation as to the fifth standard process after problem-solving and proof, communication, and connection. According to Sabirin (2014), representation is a form of interpretation of students' thoughts on a problem, which students use as a tool to find solutions to the problem. Representations also help students in organizing their thinking. Students use representations to solve problems or describe, explain, or extend mathematical ideas.

A person's mathematical representation ability, in addition to showing the level of understanding, is also closely related to problem-solving abilities in mathematics (Hudiono, 2010b). The use of representations by students can make mathematical ideas more concrete and help students solve a problem that is considered complicated and complex to be simpler if the strategy and use of mathematical representations used are by the problem. According to (Ramziah, 2018) this student's mathematical representation ability is an ability that requires students to be able to make a method of a problem into a new form either verbally, in writing, graphs, tables, or pictures. Therefore, good mathematical representation skills are needed so that the problem-solving process in mathematics is successful.

The use of media in the learning process is one of the efforts to create more meaningful and quality learning. According to Susilo (2007), the media has several uses, namely clarifying the message so that it is not too verbal; overcoming the limitations of space, time, energy and senses; creating a passion for learning, more direct interaction between students and learning resources; enable students to learn independently according to their visual, auditory and kinesthetic talents and abilities; give the same stimulus, equate experience and generate the same perception. Referring to Arsyad (2015: 3), learning media is a tool that can convey or deliver learning messages. The use of exciting learning media will increase students' motivation and interest in learning, which will make students succeed in understanding the material provided (Setyadi and Qohar, 2017:1).

(Widjayanti et al., 2018) in his research entitled Animation-Based Interactive Learning Media on Statistics Materials for Grade 7 Junior High School Students, developing animation-based interactive learning media software for grade 7 junior high school statistics material has a high category validity seen from the results of the average score from the media validation sheet of 89.05%, practically used as a learning medium with a score of 87.95%, and effectively used in learning because after the application of the media as many as 87.05% of students finished learning. This means that animation-based interactive media is feasible and recommended to be applied in learning mathematics. Meanwhile (Komariah et al., 2018), in his research entitled Development of Android-Based Middle School Mathematics Learning Media, developed android-based learning media with Construct 2 Software on number material for 7th, 8th, and 9th-grade junior high school students to produce products in the form of android applications with apk formats. The quality of the product is scored by material experts in the form of 85.3%, media experts 80%, and design development experts 93% to be categorized as very good and has met valid qualifications. In other words, the media developed in the study was considered feasible and very good for use in learning mathematics.

In addition, this study was chosen because the development of android-based interactive learning media on statistical material using mobile phones is still rare. Even though this learning media is in the form of an android application that can be run using a smartphone. Based on data released by the digital marketing research institute (eMarketer, 2015) estimated that in 2019 the number of active smartphone users in

Indonesia will be more than 100 million people. Based on data from the Mobile Operating System Market Share, Indonesia estimates that in 2020 the distribution of Android users in Indonesia will reach 93.03% in February (Statcounter, 2020). So the researchers assume that students can use the development of android-based interactive learning media in using their smartphones for learning, especially in mathematics

In line with that, Permendikbud No. 22 of 2016 has provided learning principles used to support Graduate Competency Standards and Content Standards, namely the use of information and communication technology to improve learning efficiency and effectiveness. So, the author wishes to conduct research entitled "Development of Android-based Interactive Learning Media on Statistics".

## 2. Methods

This type of research is R&D (research and development). The procedure used in this research and development is the procedure from Borg & Gall, which has been modified by the Puslitjaknov Team (Center for Policy Research and Educational Innovation) using three stages out of 5 stages, namely analyzing the needs to be developed, developing initial products, and product validation. And revision. The research subjects were students of SMP Muhammadiyah Sinar Fajar Klaten class VIII. Data collection techniques used are analysis and questionnaires.

Questionnaires are used to determine the validator's assessment in terms of material and media regarding android-based interactive learning media with statistical material. The questionnaire used in this research and development is a structured questionnaire using a Likert scale. Alternative answers according to the Likert scale are very good (SB), good (B), sufficient (C), poor (K), and very poor (SK) (Sukardi, 2009:146).

Data on developing android-based interactive learning media products in the form of descriptive data, namely reviews and suggestions from the validator in terms of material and media by the development procedures carried out. The initial stage of development research is carried out by studying literature on core and essential competencies in statistical material, collecting statistical material, mathematical representation abilities in statistical material. After that, the next stage is the preparation of research instruments and media development.

The last stage is assessment. The validator validates this media in terms of material and media. After being validated by the validator in terms of material and media, the media was then revised to obtain the final android-based interactive learning media for learning mathematics in SMP class VIII.

The resulting product feasibility data is found by analyzing the validation results from the material and media sides. Validated data from the material and media side were analyzed descriptively. The steps are as follows:

1) Change the assessment in Qualitative Form to Quantitative with the following conditions:

**Table 2. 1** Scoring Guidelines

| Qualitative Data | Score |
|---|---|
| Very Good (SB) | 5 |
| Good (B) | 4 |
| Enough (C) | 3 |
| Less (K) | 2 |
| Very Poor (SK) | 1 |

2) After the data is collected, then calculate the average score with the formula:

$$\bar{X} = \frac{\sum x}{N}$$

with:

$\bar{X} = mean\ score\ of\ each\ component$

$\sum x = total\ score$

$N = number\ of\ indicators\ assessed$

3) Change the average score into a qualitative value with the following criteria:

**Table 2. 2** Conversion of Quantitative to Qualitative Data

| Score Range | Mean Score | Kategori |
|---|---|---|
| $\boldsymbol{X > \bar{X}_i + 1,8}$ | $X > 4{,}2$ | Very Good (B) |
| $\boldsymbol{\bar{X}_i + 0,6 \times SBi < X \leq \bar{X}_i + 1,8 \times SBi}$ | $3{,}4 < X \leq 4{,}2$ | Good (B) |
| $\boldsymbol{\bar{X}_i - 0,6 \times SBi < X \leq \bar{X}_i + 1,8 \times SBi}$ | $2{,}6 < X \leq 3{,}4$ | Enough (C) |
| $\boldsymbol{\bar{X}_i - 0,6 \times SBi < X \leq \bar{X}_i - 0,6 \times SBi}$ | $1{,}8 < X \leq 2{,}6$ | Less (K) |
| $\boldsymbol{X \leq \bar{X}_i - 1,8 \times SBi}$ | $X \leq 1{,}8$ | Very Poor (SK) |

with:

$\bar{X}_i$ = ideal mean = ½ (ideal maximum score + ideal minimum score)

$SBi$ = ideal standard deviation = 1/6 (ideal maximum score – ideal minimum score)

$X$ = score obtained

This study determined that an Android-based interactive learning media product was feasible if it achieved an average score of 3.4 or the minimum criteria for getting a B value in a good category. Suppose the validator's assessment results in terms of media and material give a result of B or good. In that case, the developed Android-based interactive learning media product is feasible to be used as a learning media.

## 3. Results & Discussions

This research is a type of research and development. This research and development result is an android-based interactive learning media product with mathematics statistics for SMP class VIII. There are several problems behind the development of media in this study. These problems include:

a) The use of smartphones in schools is not optimal as a learning medium

b) Lack of teacher ability in developing learning media, especially Android-based interactive learning media.

c) There are not many media with statistical material that meet the eligibility to be used for learning.

This research and development were carried out concerning the research and development stages of Borg & Gall, which the Puslitjaknov Team developed; the researchers made simplifications and limitations into three stages, namely analyzing the needs to be developed, developing the initial product, and product validation and revision.

The development uses the Android Studio application as the main application with the help of the Visual Studio application and Figma as a supporting application to develop material content and visual design, including application icons. The content of learning media material is stored on the web so that users need an internet connection when using these learning media. The advantage is that users don't need a large amount of storage to install the learning media; on the downside, the varying conditions of internet connections in Indonesia make the speed of the content loaded in the learning media also different.


**Figure 3. 1** InMars Application on Smartphone

The primary purpose of this learning media is to represent mathematical problems into real problems as a bridge. Each material and practice question are designed according to the indicators of mathematical representation ability. It is expected that students are accustomed to representing a mathematical problem.

Validators have tested this android-based interactive learning media in terms of material and media consisting of 1 lecturer, four junior high school mathematics teachers, and 25 students. The results of the final recapitulation of material validation obtained a value of 3.75. In contrast, the final recapitulation of media validation obtained 3.64, which means it has a value in the excellent category. The developed Android-based interactive learning media is feasible for learning and linguistic aspects and programming and display aspects. Therefore, this android-based interactive learning media is appropriate for teachers to support learning mathematics in statistical material.

Each respondent has a different role in providing an assessment. A validator assessed material and media, consisting of 1 lecturer, four subject teachers, and 25 students. Based on the criteria referred to by Bokhove (2010), each tool in each instrument criterion is assessed qualitatively, namely on a 5-point scale ranging from 1 to 5. Therefore, a Likert scale is used for evaluation. According to Sugiyono (2013:132), the Likert scale measures attitudes, opinions and perceptions of a person or group of people about social phenomena.

The final recapitulation of material validation results obtained a value of 3.75, which means that the learning media is categorized as excellent or feasible for learning and linguistic aspects. While the results of the final recapitulation of media validation obtained a value of 3.64 which means that the learning media is in a good category or is suitable for use in terms of programming and display aspects. However, the feasibility of learning media certainly cannot be separated from suggestions and input by validators in terms of materials and media. After getting suggestions and input, improvements were made to change the apperception that has to do with statistics. Therefore, improvements were made to the apperception of the android-based interactive learning media front page. Improvements were also made to the line diagram material by explaining the usefulness of the material for students.

After the media has been repaired, the media is suitable for use as product trials. The product trial is only to ensure that the Android-based interactive learning media is based on student responses; students are very enthusiastic and very interesting in the presence of the Android-based interactive learning media. Because the media only saw the feasibility of the validity results by the validators and the responses given by the students were very interesting, at this stage, no further improvements were made. The trial was carried out to see the students' response from this learning media. The results were that the response of students was very enthusiastic and very interesting with this media.

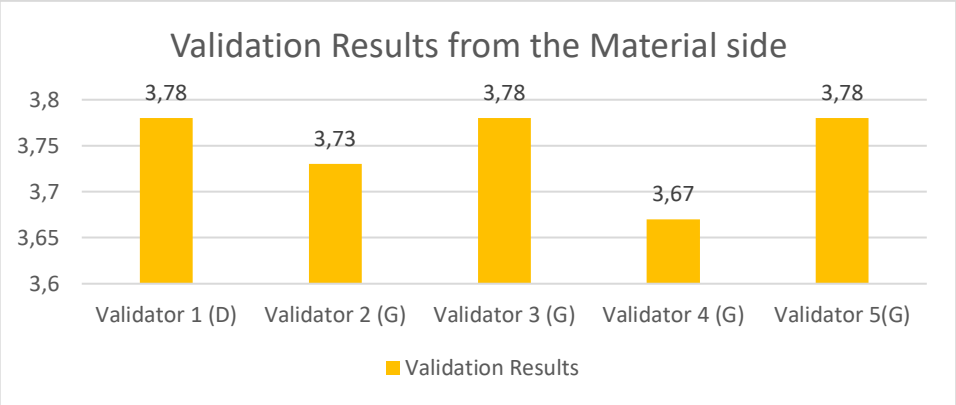


**Figure 3. 2** Diagram of the Validation Results of the Five Validators of Each Aspect from the Material side

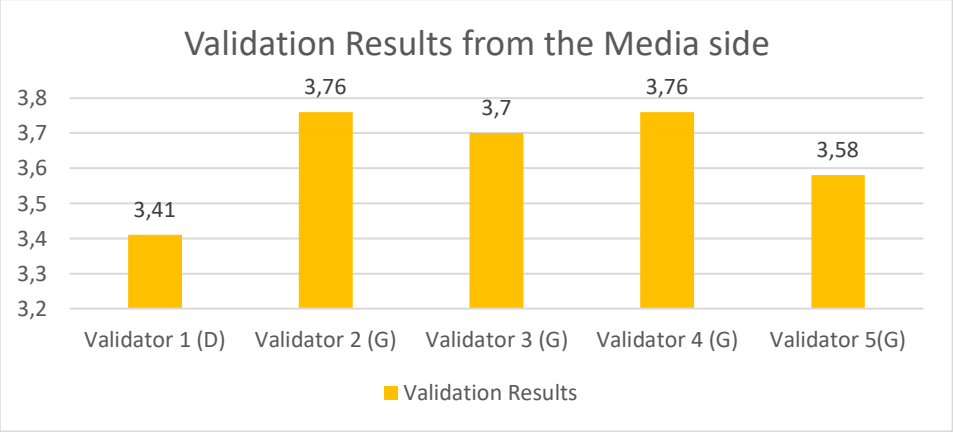


**Figure 3. 3** Diagram of the Validation Results of the Five Validators of Each Aspect from the Media side

The results of this study are in line with the results of research conducted by (Nofrizal, 2017) that the learning media developed is feasible as a learning medium with a score of 3.75 from the material side and a score from the media side of 3.64, as shown in Figure 3.2 and Figure 3.3, which means that the media is suitable for use as learning media.

## 4. Conclusion

This research and development aim to produce Android-based interactive learning media with statistical material for class VIII SMP. The developed media was declared suitable for use based on validation by the validator from the material side, validation by the validator from the media side, and the test results by the teacher and student responses.

The trial was carried out to see the students' response from this learning media. The results were that the response of students was very enthusiastic and very interesting with this media. The results of this study are in line with the results of research conducted by (Nofrizal 2017) that the learning media developed is feasible as a learning medium with a score of 3.75 from the material side and a score from the media side of 3.64, which means that the media is feasible to be used as a learning media.

## References

Arsyad, A. 2015. *Media Pembelajaran (Edisi Revisi)*. Jakarta: Rajawali Pers.

Bokhove, C., & Drijvers, P (2010). *Digital tools for algebra education: criteria and evaluation*. International Journal of Computers for Mathematical Learning, 15(1), 45-62.

Hudiono, B. 2010b. *Peran Pembelajaran Diskursus Multi Representasi terhadap Pengembangan Kemampuan Matematika dan Daya Representasi pada Siswa SLTP*. Jurnal Cakrawala Kependidikan

Vol. 8 No. 2: 101-203. Tersedia di http://jurnal.untan.ac.id/index.php/jckrw/article/view/156 [diakses 03-02-2020].
Kemendikbud. (2013). *Modul Kurikulum 2013*. Jakarta: Kementrian Pendidikan Dan Kebudayaan.
Kemendikbud. (2016). *Permendikbud No 21 Tahun 2016 Tentang Standar Isi.* Jakarta: Kemendikbud.
Kemendikbud. (2016). *Permendikbud No 22 Tahun 2016 Tentang Standar Proses Pendidikan Dasar dan Menengah.* Jakarta: Kemendikbud.
Kemendikbud. (2018). *Pusat Penilaian Pendidikan: Laporan Hasil Ujian Nasional*. Jakarta: Kemendikbud. Tersedia di https://hasilun.puspendik.kemdikbud.go.id/#2019!smp!capaian_nasional!03&99&999!T&T&T&T&1&!1!&. [diakses 16-02-2020].
Komariah, S., Suhendri, H. and Hakim, A. R. (2018) 'Pengembangan Media Pembelajaran Matematika Siswa SMP Berbasis Android', *JKPM (Jurnal Kajian Pendidikan Matematika)*, 4(1), p. 43. doi: 10.30998/jkpm.v4i1.2805.
Meredith D Gall, Joyce P Gall & Walker R. Borg. 2003. *Educational Research an Introduction* (7th ed.). Boston: Pearson Education, Inc.
National Council of Teachers of Mathematics ed. (2000). *Principles and standards for school mathematics (Vol. 1).* National Council of Teachers of Mathematics.
OECD (2019a) *PISA 2018 Results: What Student Student Know and Can Do*. doi: 10.1787/5f07c754-en.
OECD (2019b) *Where All Students Can Succeed. Pisa 2018 Results*.
Sabirin, M. (2014). Representasi dalam Pembelajaran Matematika. *Jurnal Pendidikan Matematika UIN Antasari*, 1(2): 33-44.
Setyadi, D., & Abd. Qohar. 2017. Pengembangan Media Pembelajaran Matematika Berbasis Web pada Materi Barisan dan Deret. *Kreano*, 8(1): 1-7.
Setyadi, D. 2017. Pengembangan Mobile Learning Berbasis Android Sebagai Sarana Berlatih Mengerjakan Soal Matematika. *Satya Widya,* 32(2): 87-92
StatCounter. (2020). *StatCounter GlobalStats: Mobile Operating System Market Share Indonesia January 2019-January 2020.* Tersedia di https://gs.statcounter.com/os-market-share/mobile/indonesia. [diakses 10-02-2020].
Sukardi. 2009. *Metodologi Penelitian Pendidikan* (*Kompetensi dan Praktiknya*). Jakarta: Bumi Aksara.
Susilo, M. J. (2007). *Kurikulum tingkat satuan pendidikan: manajemen pelaksanaan dan kesiapan sekolah menyongsongnya*. Yogyakarta: Pustaka Pelajar.
Walker, Decker F & Hess, Robert D. 1984. *Instructional Software: Principles and Perspectives for Design and Use*. California: Wadsworth Publishing Company.
Widjayanti, W. R., Masfingatin, T. and Setyansah, R. K. (2018) 'Media Pembelajaran Interaktif Berbasis Animasi Pada Materi Statistika Untuk Siswa Kelas 7 Smp', *Jurnal Pendidikan Matematika*, 13(1), pp. 101–112. doi: 10.22342/jpm.13.1.6294.101-112.