Development of Mobile Learning Application Media (M-Geo Ganesha) Based on Android and Its Implications for the Effectiveness of Geography Learning at SMA N 1 Banjar

I Dewa Made Adi Bayu Sadewa[1], I Putu Ananda Citra[2], Ida Bagus Made Astawa[3], I Putu Rizky Firmandy[4], Kadek Sri Budiawan[5]

adi.bayu@undiksha.ac.id[1], ananda.citra@undiksha.ac.id[2], md.astawa@undiksha.ac.id[3], rizky.firmandy@undiksha.ac.id[4], sri.budiawan@undiksha.ac.id[5]

Universitas Pendidikan Ganesha, Indonesia[1,2,3,4,5]

Abstract. This study examines the integration of information and communication technology (ICT) in education, aligning with the principles outlined in Indonesia's Minister of Education, Culture, Research, and Technology Decree Number 56/M/2022. The research focuses on the development and validation of an Android-based mobile learning application, M-Geo Ganesha, designed for high school geography students. The application aims to facilitate meaningful, holistic, and future-oriented learning, in line with the current educational guidelines. The development process adhered to the 4D model, ensuring the application's feasibility and quality. Expert validations yielded high scores, with content experts rating it at 83.5 (feasible) and media experts at 92.6 (very feasible). Teachers and students also responded positively, with average scores of 93.3 (very interesting) and 82.1 (very feasible) respectively in small group trials, and 79.48 (interesting) in large group trials. The effectiveness of the application was assessed using the N-Gain test, which compared pre-test and post-test scores, resulting in an N-Gain value of 0.69, categorizing the learning outcome as "moderate." These findings underscore the potential of ICT-based learning media in enhancing educational experiences and supporting lifelong learning competencies.

Keywords: Effectiveness of Learning, Android-Based Mobile Learning Application Media, Geography Learning.

1 Introduction

According to Law Number 20 of 2003, education is a planned effort to develop learners' potential so that they become individuals who are faithful, devoted to God the Almighty, possess noble character, are healthy, knowledgeable, creative, independent, and responsible. According to the Minister of Education, Culture, Research, and Technology Decree Number 56/M/2022 concerning Guidelines for Curriculum Implementation in the Context of Learning Recovery, there are five (5) principles that are emphasized in learning:

1) The design of learning takes into account the current developmental stage and achievement level of students, aligns with their learning needs, and reflects their diverse characteristics and development to make learning meaningful and enjoyable;
2) Design and implement learning to build capacity for lifelong learning;

ICLSSE 2024, October 17, Singaraja, Indonesia

DOI 10.4108/eai.17-10-2024.2353692

3) The learning process supports the holistic development of students' competencies and character;
4) Relevant learning, which means learning designed according to the context, environment, and culture of students and involves parents and the community as partners,
5) Future-oriented learning that is sustainable.

The advancement of science and technology has driven the development of new innovations in the utilization of technical results in the field of education. All fields of study must integrate information and communication technology in accordance with the current independent curriculum [1]. Teachers must be able to master technology in order for teachers to create innovative learning media that can serve as supportive tools in the learning process. The development of technology today is accelerating rapidly because almost all human activities rely on it. In a similar vein, all activities within educational institutions, including schools and universities, are increasingly utilizing advanced technology. However, many educational institutions use technology inefficiently. In this regard, educational institutions are required to enhance their ability to develop learning applications that are easily accessible to every smartphone user, which is one example of the appropriate application of technology in the field of education in the era of globalization [2].

This aligns with the 21st century learning paradigm, which necessitates innovation in the creation of learning resources to keep pace with the advancements in science and technology[3]. This includes the development of learning applications, commonly known as mobile learning. Mobile Learning. This learning application is an Android-based learning medium that utilizes application and communication technology devices. In this era of globalization, many technological breakthroughs in learning media are likely to emerge. Mobile-based learning (learning tools on mobile phones) is one example [4]. The rapid development of mobile technology in terms of networks and devices has led to significant technological advancements. The advancement in smartphone usage has spread widely, including to remote rural and interior areas [5].

In this case, geography learning primarily focuses on memorization of concepts without considering their practical application in daily life. The lack of critical thinking and active engagement in learning activities caused by this phenomenon prevents students from realizing the goals of geography education .

Based on observations made with the geography teacher during the learning process at SMA N 1 Banjar, it appears that the use of learning media such as modules, textbooks, and simple presentation PPTs still dominates. Unfortunately, using those media is not very effective. Teachers still apply conventional methods such as lectures, question-and-answer sessions, and discussions without utilizing innovative learning media like mobile learning and e-learning. According to interviews with tenth-grade students at SMA N 1 Banjar, all students own smartphones, but they are only used for entertainment purposes such as listening to music, watching videos, gaming, and using social media. Therefore, if equipped with educational apps and content, smartphones could transform into innovative and engaging learning tools, boosting student interest and involvement and offering a fresh learning experience.

Mobile learning offers the advantage of delivering knowledge and technology that prioritizes speed, convenience, and appeal, all while upholding the fundamental principles of learning [6]. In conclusion, students can conduct learning through mobile learning without feeling pressured. Mobile learning is an alternative learning medium because it combines visuals, sound, and text to help users access knowledge [7].

2 Methods

Conducted this research at SMA N 1 Banjar. The 4D model serves as the basis for this research and development [8]. Conduct the trials through three stages of activities: expert testing of materials and media, large group testing, and small group testing. Observing the activities conducted during the trials of the produced products, the design used is descriptive design. By describing a number of variables related to the issues or units under study, descriptive design aims to explore and clarify a phenomenon or social reality [9]. The phenomena described in this research and development include expert validation results, as well as results from large and small group trials. The research methods used include interview methods with interview guidelines, survey methods with questionnaires, and documentation methods. This study's population consists of 31 students and geography teachers from SMA N 1 Banjar. The instruments used in this research include preliminary study instruments, expert validation instruments, questionnaires for teachers and students, effectiveness assessment instruments in the form of pretests and posttests, and product trial instruments. This design uses pretests and posttests for the experimental and control classes to assess the effectiveness of learning using the Android mobile learning application (M-Geo Ganesha). We first test the validity of the research instrument before using it, and we employ descriptive statistics in the form of a data validation test and inferential statistics in the form of an N-gain test for data analysis.

3 Result and Discussion

3.1 Define

3.1.1 Front-End-Analysis

The obtained the results of the initial and final analysis by conducting interviews with grade 10 geography teachers and distributing student needs questionnaires in the class. Interviews with the teachers revealed that the learning program for grade 10 students employs the Merdeka Curriculum. Teachers often use teaching resources such as worksheets, PowerPoint presentations, and textbooks to explain the material on maps, remote sensing, and geographic information systems. A total of 31 students have Android smartphones. The reasons students struggle to understand the material and show a lack of interest in learning are due to several factors, such as boredom from having already studied the content, difficulty in understanding certain parts of the material like scale distance calculations and satellite image interpretation, among others, as well as a lack of knowledge and study time. Rarely do educators use a variety of learning media. This is what causes the learning process in the classroom to be less effective.

3.1.2 Concept Analysis

This conceptual analysis includes an examination of teaching modules and the results of interviews with teachers about maps, remote sensing, and geographic information systems. We not only scrutinize the concepts taught, but also arrange the steps of the learning process we've conducted. We systematically develop the main sections or concept maps of the learning material and select them using the problem-based learning model. This model is considered most relevant to the fields of mapping, remote sensing, and geographic information systems, and it aligns with the demands of learning outcomes. This activity also aims to ensure that the learning medium developed is consistent with the learning outcomes outlined in the curriculum [10].

3.1.3 Task Analysis

At this stage, we conduct an analysis of the Merdeka Curriculum's CP and ATP for geography subjects in grade 10, with a focus on maps, remote sensing, and geographic information systems. We also cover several other subtopics, such as map components, types of maps, map-making skills, and map projections. The remote sensing material covers remote sensing components, types of remote sensing images, and image interpretation. The geographic information systems material includes GIS components. Therefore, the development of the Android-based mobile learning application (M-Geo Ganesha) must align with the guidelines of CP and ATP.

3.1.4 Learning Objectives Analysis

Conduct the analysis with reference to the learning objectives outlined in the Merdeka curriculum for geography subjects, specifically focusing on maps, remote sensing, and geographic information systems. According to the analysis of tasks and concepts in these materials, there is a need for media that can support student engagement and effective learning [10]. The demand for independent learning and the advancement of technology in education have led to the development of mobile learning through an Android system application. The Merdeka curriculum's geography learning outcomes guide the design of this application.

3.2 Design

3.2.1 Media Selection

According to an interview with the geography teacher, SMAN 1 Banjar uses worksheets, PowerPoint presentations, and textbooks in the learning process and allows students to use their smartphones. However, the lack of full utilization of smartphones as a learning medium has hindered the effectiveness and efficiency of the learning activities. Therefore, the developers offer a mobile learning application (M-Geo Ganesha) based on Android that contains materials, concept maps, videos, glossaries, and practice questions for topics on maps, remote sensing, and geographic information systems.

3.2.2 Selection of Format

The developed medium, M-Geo Ganesha, is a mobile learning platform. We selected this name due to the media's emphasis on geography content. This mobile learning includes elements

such as concept maps, glossaries, material descriptions, images, videos, and evaluation practice questions.

3.2.3 Product Development Schedule

This product will be produced for approximately six months, from February 2024 until July 2024. The activities for creating the mobile learning application (M-Geo Ganesha) include the stages of definition, design, and development. Product development begins with conducting preliminary studies in the form of interviews and distributing needs questionnaires, creating storyboards, designing the user interface, developing product content, validating the product with subject matter experts and media experts, as well as testing the product on trial subjects.

3.2.4 Product Design Specifications

The initial design of mobile learning media (M-Geo Ganesha) involves several stages. Choosing the devices or media that will support the product creation is the first step. Some of the media used include Microsoft Word, Canva, and the Kodular website. The second stage involves designing the content for the learning medium [11]. The first step in this stage involves designing the content, which is based on an analysis of the learning objectives. This ensures that the learning media focuses on topics such as maps, remote sensing, and geographic information systems. We prepare the content outline using Microsoft Word and Canva. The third stage is to create a flowchart and storyboard for the content in the developed learning medium. The purpose of creating a flowchart and storyboard is to provide a rough outline of how the educational media application works [12]. We carry out this process using Microsoft Office and PowerPoint. Flowcharts and storyboards help provide direction and clarity to the operation flow of mobile learning media, as shown in the related images and tables. The fourth stage involves creating the content media layout and mobile learning appearance using Canva. Canva comprehensively designs the learning media content, which includes teaching materials, videos, evaluation questions, and a glossary[13] . The mobile learning interface (M-Geo Ganesha) also features an introduction, logo, button icons, or menu options created with Canva.

Figure 1. Mobile Learning display and main menu design stage

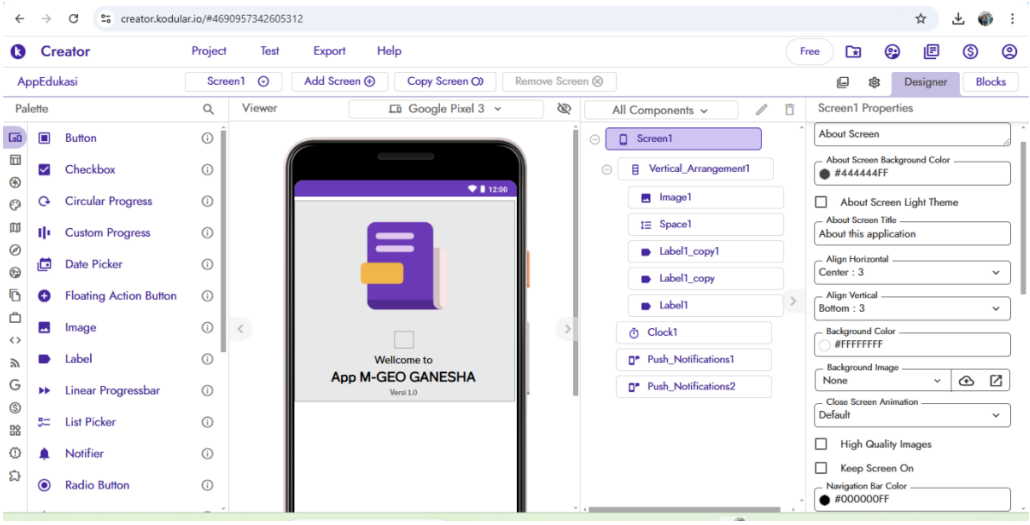
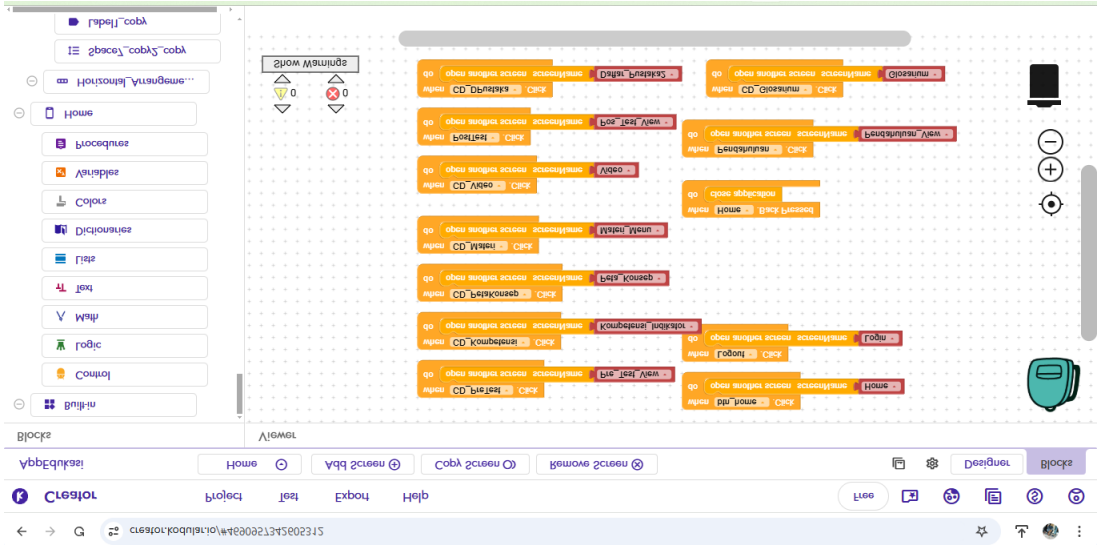


Figure 2. Product blocking/coding stage



We have designed and developed a mobile learning application for smartphones and Android devices. Here's an explanation of the components in this product:

Figure 3. (a) splash display, (b) mobile learning front page

(a) **(b)**

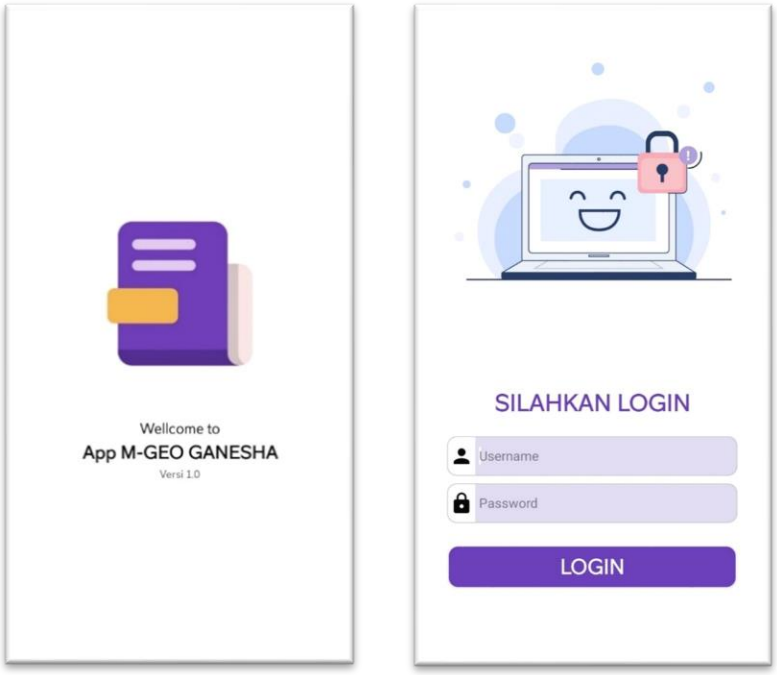


Figure 4. (a) main menu, (b) developer profil page

(a) **(b)**

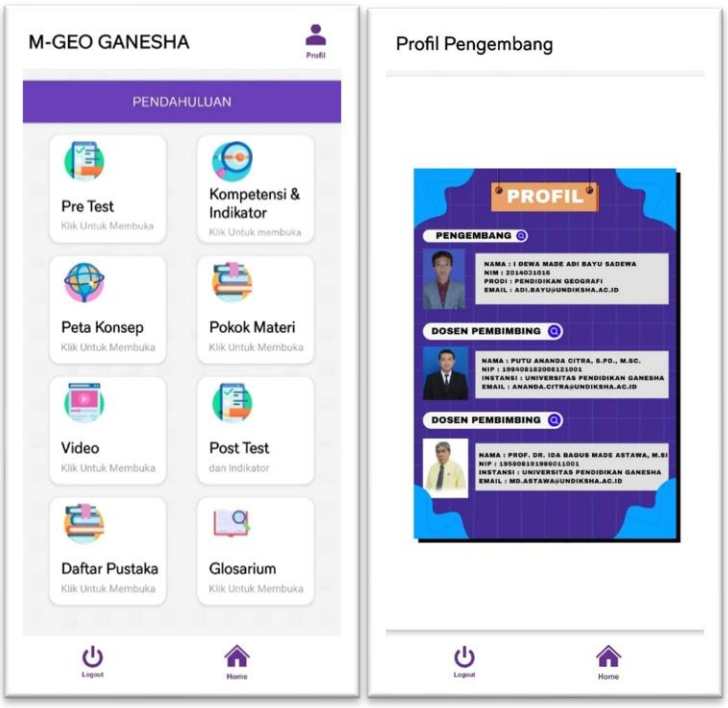


Figure 5. (a) concept map page, (b) material display page

(a) **(b)**

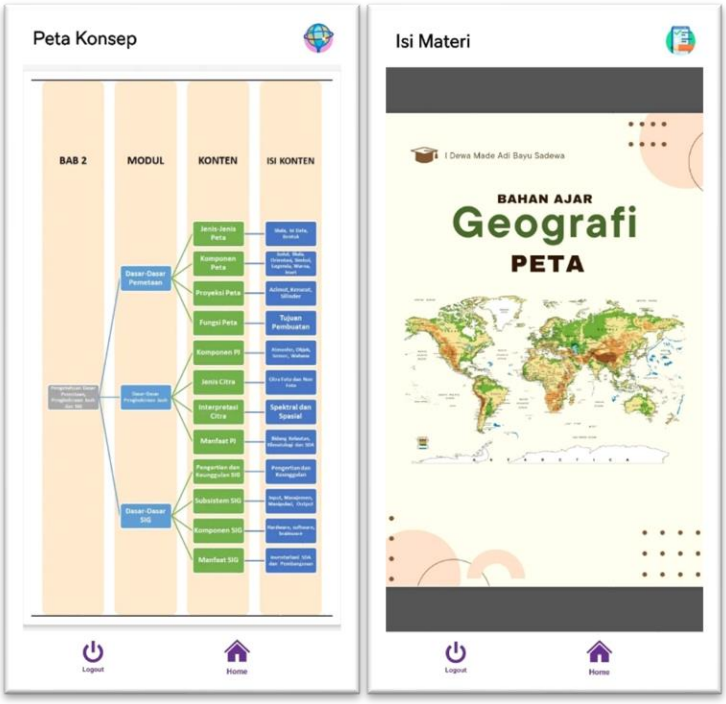


Figure 6. (a) learning video material display, (b) Post test question display

(a) **(b)**

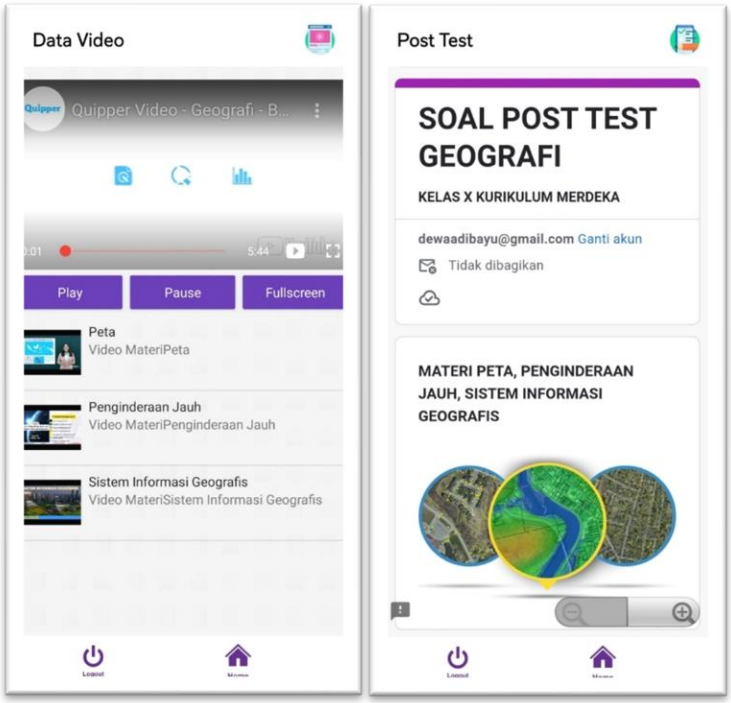


Figure 7. (a) geography glossary display

3.3 Develop

Developed the mobile learning product (M-Geo Ganesha) as an application using the Kodular website and Canva, incorporating materials on maps, remote sensing, and geographic information systems. Subject matter experts and media specialists carry out validation after the media creation process is complete.

3.3.1 Validation of Subject Matter Experts

Subject matter experts have validated the Android-based mobile learning application product (M-Geo Ganesha), which covers materials on maps, remote sensing, and geographic information systems. Mr. Made Dwipayana, S.Pd., M.Sc., an expert in the field of remote sensing, conducted the validity assessment of the product. Developers use the comments and suggestions from expert validators in the field of study to enhance the product. Here are the results of the expert validation questionnaire for the subject matter presented in Table 1.

Table 1. Results of Expert Assessment of the Study Field for Mobile Learning Application Media (M-Geo Ganesha) Based on Android

No	Statement	Score
(1)	**(2)**	**(3)**
1	Alignment of material with basic competencies	4
2	Alignment of material with indicators	4
3	Alignment of material with learning objectives	5
4	Material discussed in complete media	5
5	Material presented systematically	4
6	Material presented clearly	5
7	Material delivered in an engaging manner	4
8	Material presented is easy to understand	4
9	Questions formulated clearly	3
10	Questions in the media are complete	3
11	Questions align with theory and concepts	4
12	Answer keys correspond to the questions	5
13	Evaluation is consistent with learning objectives	4
14	Language used is communicative	4
15	Material presented can motivate students to learn	4
16	Students are more active in engaging in learning activities.	5
17	Terms and questions used are appropriate and accurate	4
	Jumlah	**71**

Score obtained : 71
Maximum score = 85

Value $= \frac{Score\ obtained}{Maximum\ score}$ x 100

Value $= \frac{71}{85}$ x 100

= (0.835) x 100
= 83.5

The subject matter experts' assessment score is 83.5, which, when converted into the criteria for learning media feasibility, falls into the "feasible" category. However, we need to make improvements based on the verbal comments and suggestions from the subject matter experts to enhance the quality and perfection of the developed learning media.

3.3.2 Media Expert Validation

Media learning experts have validated the mobile learning application product (M-Geo Ganesha), which is based on Android and covers materials on maps, remote sensing, and geographic information systems. Mr. I Gde Wawan Sudatha, S.Pd., S.T., M.Pd., an expert in the field of multimedia learning, conducted the validity/product assessment. The developers use the comments and suggestions from expert media validators as material to improve the product. Here are the results of the expert validation questionnaire presented in Table 2.

Table 2. The Media Expert Assessment results for the Android-based Mobile Learning Application (M-Geo Ganesha) are available.

No	Statement	Score
(1)	(2)	(3)
1	The application file size is not large	5
2	The application does not run slowly	5
3	The application does not freeze during operation	5
4	The application does not cause the phone to freeze	5
5	The application can run on all types of Android operating systems	5
6	The application can run on various hardware specifications	5
7	The application is easy to use	5
8	It has a clear usage flow	4
9	The operation of the application is simple	4
10	Users can interact with the application	5
11	Creative in expressing ideas	4
12	Creative and innovative (new, interesting, smart, and unique)	4
13	The design used in the application is appealing	5
14	The text is easily readable	5
15	The color selection in the application is appropriate	5
16	The animations used are engaging	4
17	The animations used are not distracting	4
18	The navigation is simple	4
19	The navigation functions well	5
	Total	**88**

Score obtained : 88
Maximum score = 95

Value $= \frac{Score\ obtained}{Maximum\ score}$ x 100

Value $= \frac{88}{95}$ x 100

= (0.926) x 100
= 92.6

The media expert's evaluation score is 92.6, which, when converted into the criteria for learning media feasibility, falls into the "Very Feasible" category. However, we need to make improvements based on the verbal comments and suggestions from the media expert to enhance the quality and perfection of the developed learning media.

3.4 Product Trial

Media experts and subject matter experts have tested and validated the feasibility of the Android-based mobile learning application Media (M-Geo Ganesha). We then tested it with geography teachers and trialed it with students to gauge their interest through a questionnaire. The aim is to analyze the response results as material for improving (further revision) of the mobile learning application media product that is being developed.

a. Results from the Small Group Trial

Responses to the student questionnaire yielded the results of the small group trial on the developed product. We conducted the small group trial by distributing a questionnaire to 10 respondents, who were students from class X at SMA Negeri 1 Banjar. The questionnaire consists of 15 items.

Table 3. Displays the Results of the Small Group Trial

No	**Value Interval**	**Criteria**	**Student Assessment Results**	
			N	%
(1)	(2)	(3)	(4)	(5)
1	20 – 35	Not Feasible	0	0
2	36 – 51	Less Feasible	0	0
3	52 – 67	Quite Feasible	0	0
4	68 – 83	Feasible	6	60%
5	84 – 100	Very Feasible	4	40%
	Total		**10**	**100%**
	Mean		82.1	
	Highest value		100	
	Lowest value		76	
	Standard Deviation		8.05	

Students assessments of the Android-based mobile learning application (M-Geo Ganesha) during the small group testing revealed that 6 students met the " Feasible " criteria, 4 students

met the "Very Feasible" criteria, and the average score reached 82.1. Therefore, we can conclude that the students found the Android-based mobile learning application (M-Geo Ganesha) to be "Feasible " during the learning process.

b. Data Results from Geography Subject Teacher Responses

Subject matter experts and media specialists have developed M-Geo Ganesha, an Android mobile learning application, and have confirmed its readiness for trial testing. We then distributed this product to the geography teachers at SMA N 1 Banjar. We conduct the teacher response survey to collect opinions, suggestions, and comments about the developed products. Table 4 presents the results of the teacher's assessment.

Table 4. Results of the Geography Subject Teacher Response Data

No	Statement	Score
(1)	**(2)**	**(3)**
1	The alignment of the material with the basic competencies	4
2	The suitability of the material with the indicator	4
3	The suitability of the material according to the students' development	5
4	The level of practicality of the media	5
5	The initial appearance of the media is engaging	4
6	The convenience of selecting menu items	5
7	The use in applications is easy to operate	4
8	Clarity of usage instructions	5
9	Media can be used in various places, times, and situations	5
10	The media used is engaging	5
11	Media can train students' independence in learning	5
12	The image display in the application is appealing	5
13	Placement of images	4
14	The suitability of images to clarify the material	5
15	The harmony of the background color with the text	5
	Total	**70**

Score obtained : 70
Maximum score = 75

Value $= \frac{Score\ obtained}{Maximum\ score}$ x 100

Value $= \frac{70}{75}$ x 100

= (0.933) x 100
= 93.3

According to Table 4, the responses from geography teachers at SMA Negeri 1 Banjar overall received a score of 93.3, which falls into the "Very Interesting" category for use as a learning medium.

c. Data from Large Group Trials

Students fill out a questionnaire to assess the results of the large group trial of the developed product. We distributed the questionnaire to 31 students in class X 7 at SMA Negeri 1 Banjar. The questionnaire presented consists of 15 items.

Table 5. Displays the Results of the Large Group Trials

No	Value Interval	Criteria	Student Assessment Results	
			N	%
(1)	(2)	(3)	(4)	(5)
1	20 – 35	Not Interesting	0	0
2	36 – 51	Less Interesting	0	0
3	52 – 67	Quite Interesting	8	26%
4	68 – 83	Interesting	9	29%
5	84 – 100	Very Interesting	14	45%
Total			**31**	**100%**
Mean			79.48	
Highest value			100	
Lowest value			55	
Standard Deviation			13.36	

Students assessments of the Android-based mobile learning application (M-Geo Ganesha) during the large group test revealed that 8 students met the criteria of "fairly interesting," 9 students met the criteria of "interesting," and 14 students met the criteria of "very interesting," achieving an average score of 79.48. Therefore, we can conclude that students find the Android-based mobile learning application (M-Geo Ganesha) to be "interesting" for their learning.

3.5 Testing the Effectiveness of Implementing Mobile Learning Products (M-Geo Ganesha) in Geography Learning

The results of the data processing collected from 31 students in class X 7 show an increase in the average score between the pretest and posttest regarding the effectiveness of implementing the mobile learning application product (M-Geo Ganesha) using multiple-choice test questions, as can be seen in Table 6.

Table 6. Results Pretest and Posttest

No	Score Interval	Criteria	Pre Test		Post Test	
			N	%	N	%
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	0 – 19	Very Poor	0	0.00	0	0.00
2	20 – 39	Poor	11	35.00	0	0.00
3	40 – 59	Fair	12	39.00	0	0.00
4	60 – 79	Good	7	23.00	7	23.00

5	80 – 100	Very Good	1	3.00	24	77.00
Total			**31**	**100.00**	**31**	**100.00**
Average Value (Mean)			44.00		83.00	
Average increase			39.00			
Highest Score			80		100	
Lowest Score			20		60	
Standard Deviation			15.84		11.65	

Next, perform the calculation with the N-Gain formula, using a standard calibration of 100. The goal is to determine how effective the implementation of Android-based mobile learning application media (M-Geo Ganesha). The following are the results:

$$N\text{-}Gain = \frac{\text{Score post test} - \text{Score pre test}}{\text{Score maksimal} - \text{Score pre test}}$$
$$= \frac{83{,}00 - 44{,}00}{100 - 44{,}00}$$
$$= \frac{39}{56}$$
$$= 0.69$$

The carried out calculations yielded an N-Gain value of 0.69, indicating that the N-Gain falls into the "moderate" category when interpreted in terms of effectiveness learning geography.

4 Conclusion

The derived following conclusions from the research and development results of the Android-based mobile learning media (M-Geo Ganesha) for class X SMA students. Developed the learning media, M-Geo Ganesha, a mobile learning application based on Android, using the 4D development model. The validation conducted by subject matter experts and media experts showed good results, with a content expert validation score of 83.5, which falls into the "feasible" category, and a media expert validation score of 92.6, which falls into the "very feasible" category. Teachers' responses to the mobile learning application (M-Geo Ganesha) are very positive, with a product quality score of 93.3, which falls into the "very interesting" category. Students' responses to this application were also positive, with an average score of 82.1 in the small group trial, which falls into the "very feasible" category, and a score of 79.48 in the large group trial, which also falls into the "interesting" category. Tested the effectiveness of the media using the N-Gain test, which compares the pre-test score (average 44.00) and the post-test score (average 83.00). The results indicate that this application falls into the "Moderate" category with an N-Gain value of 0.69.

References

[1] A. Labellapansa *et al.*, “Augmented Reality Bangunan Bersejarah Berbasis Android (Studi Kasus : Istana Siak Sri Indrapura),” vol. 1, no. 2, pp. 1–12, 2017.

[2] G. Amirullah, “Pengembangan Media Pembelajaran Interaktif Pada Konsep Monera Berbasis Smartphone Android,” pp. 38–47.

[3] A. Rohmawati, “EFEKTIVITAS PEMBELAJARAN,” *J. Pendidik. Anak Usia Dini*, vol. 9, no. 1, pp. 15–32, 2015.

[4] N. A. Erlinawati *et al.*, “MEDIA PEMBELAJARAN MOBILE LEARNING UNTUK MENINGKATKAN MOTIVASI DAN KEMAMPUAN PRAKTIKUM,” pp. 298–310.

[5] U. Meningkatkan and K. Matematis, “PENGEMBANGAN MEDIA AJAR MATEMATIKA DENGAN MENGGUNAKAN MEDIA MICROSOFT VISUAL BASIC UNTUK MENINGKATKAN KEMAMPUAN MATEMATIS MAHASISWA Achi Rinaldi,” vol. 4, no. 1, 2018.

[6] A. A. Sulia Ningsih, “Pengembangan Mobile Learning Berbasis Android pada Mata Kuliah Strategi Pembelajaran Universitas Baturaja,” *J. Kaji. Teknol. Pendidik.*, vol. 4, no. 2, pp. 163–172, 2019.

[7] V. N. December, A. Rasyid, and A. A. Gaffar, “Biodik : Jurnal Ilmiah Pendidikan Biologi Development of Mobile Learning Model Games Application " Antibody vs Antigen " Using RPG Maker MV on the Immune System material Pengembangan Aplikasi Mobile Learning Model Games ‘ Antibody vs Antigen ’ Menggunakan RPG Maker MV pada materi Sistem Imun Received : 29 Agust 2019 Revised : 20 September 2019 Accepted : 24 October 2019,” vol. 5, no. 3, pp. 225–238, 2019.

[8] ADELINA HASYIM, *Metode penelitian dan pengembangan di sekolah / Adelina Hasyim*. Yogyakarta: Media Akademi, 2016.

[9] A. Kusumam and B. Hasan, “PENGEMBANGAN BAHAN AJAR MATA PELAJARAN,” vol. 23, pp. 28–39, 2016.

[10] N. Sinambela, “Keefektifan Model Pembelajaran Berdasarkan Masalah (Problem-Based intruction) Program Pasca Sarjana Universitas Negeri Surabaya,” Surabaya: Program Pasca Sarjana Universitas Negeri Surabaya, 2006.

[11] D. P. Noca Yolanda Sari, Dimas Agustiyan, “PERANCANGAN MEDIA PEMBELAJARAN MOBILE LEARNING MATERI MACAM-MACAM BATUAN PADA MATA PELAJARAN GEOGRAFI BERBASIS WEB MOBILE,” *J. Manaj. Pendidik. Al Multazam*, vol. 3, no. 2, pp. 49–56, 2021.

[12] Sambodo R. A., “Pengembangan Media Pembelajaran Mobile Learning Pada Siswa Kelas XI Tentang Materi Sistem Sirkulasi Peredaran Darah,” 2014.

[13] M. Erni Mardliyani Rahmawati, “PENGEMBANGANG M-LEARNING UNTUK MENDUKUNG KEMANDIRIAN DAN HASIL BELAJAR MATA PELAJARAN GEOGRAFI,” *J. Inov. Teknol. Pendidik.*, vol. 4, no. 2, pp. 157–166, 2017.