

## THE DEVELOPMENT OF AMAZING NGANJUK ETHNOMATHEMATICS-BASED APPLICATION FOR THE PLANE SHAPE MATERIAL FOR GRADE IV OF ISLAMIC ELEMENTARY SCHOOL

Yusi Krisma Tanti<sup>1</sup>, Choirul Annisa<sup>2</sup>, Puspoko Ponco Ratno<sup>3</sup>

IAIN Kediri, Indonesia<sup>1,2,3</sup>

E-mail: [krismatanti@gmail.com](mailto:krismatanti@gmail.com)<sup>1</sup>, [choirul.annisa@iainkediri.ac.id](mailto:choirul.annisa@iainkediri.ac.id)<sup>2</sup>,  
[puspoko.ponco@iainkediri.ac.id](mailto:puspoko.ponco@iainkediri.ac.id)<sup>3</sup>

DOI: 10.14421/al-bidayah.v15i2.1037

### ABSTRACT

This research-and-development is motivated by the need for the use of culture-based learning media in the mathematics subject because, during learning, teachers often only focus on material without any integration with culture, and there is a lack of students' knowledge of the culture that exists in Nganjuk Regency. The purpose of this research and development is to examine the ethnomathematics in the culture of Nganjuk and analyze the development and feasibility level of the ethnomathematics-based *Amazing Nganjuk* application for the plane shape material of grade IV in Islamic elementary schools. This study is of Research and Development (R&D) type that uses the Alessi and Trollip model of 3 stages, which include planning, design, and development. The product trial was carried out through the alpha test and beta test. The alpha test was conducted by media experts and material experts while the beta test was conducted by the fourth-grade students of Islamic Elementary School (IES) Khadijah Sukorejo Loceret Nganjuk. The result of this research and development was an ethnomathematics-based android application. The ethnomathematics elements found in this study were Jayastamba monument, *wayang timplong*, *gamelan gender*, and *demung*. The results of the media and material validation showed an average percentage of feasibility level of 96% and 93.75% with a very feasible category for use in the beta test. The beta test obtained an average percentage of 97% with the category indicating that the fourth-grade students strongly agreed with the use of the *Amazing Nganjuk* application to learn plane shapes. The application that the researchers have developed is deemed suitable for use as a learning medium, especially for the plane shape material.

**Keywords:** *amazing Nganjuk*; android application; ethnomathematics; plane shape

### INTRODUCTION

Education is a process that aims to educate individuals to be useful for the nation and state.<sup>1</sup> Law No. 20 of 2003 states that education is a conscious and planned effort to create a learning atmosphere and learning process to allow students to actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and skills needed by themselves, the society, nation, and state.<sup>2</sup> Given the importance of education, proper management is required to allow education to be the

---

<sup>1</sup> Yayan Alpian et al., "Pentingnya Pendidikan Bagi Manusia," *Jurnal Buana Pengabdian* 1, no. 1 (2019): 67–68.

<sup>2</sup> Presiden Republik Indonesia, "Undang-Undang No. 20 Tahun 2003 Tentang Sistem Pendidikan Nasional" (2003).



source in realizing the advancement of the nation and state.<sup>3</sup> Therefore, the state must establish some rules related to the legal basis for creating globally competitive and quality education.<sup>4,5</sup>

The curriculum is one of the plans to manage learning to achieve the expected educational goals.<sup>6,7</sup> Along with the current development, the curriculum in Indonesia continues to change. The newly launched curriculum is currently the independent curriculum. However, in the even semester of the 2022/2023 academic year, there are still many schools that use the 2013 curriculum, one of which is IES Khadijah. The 2013 curriculum aims to make students become more active individuals in observing, asking, reasoning, and presenting the results of their learning after receiving the learning material. The 2013 curriculum is expected to prepare Indonesian citizens to become individuals who are religious, productive, creative, innovative, and affective as well as able to contribute to the life of the society, nation, state, and world civilization. In addition, the 2013 curriculum has the characteristics to prepare students to deal with changes in the era of globalization. Therefore, the implementation of the 2013 curriculum requires the utilization of Information and Communication Technology (ICT) as an effort to develop learning innovations in the classroom.

In today's digital era, technology greatly affects the quality of education.<sup>8,9</sup> Every activity carried out by educators and learners is always closely related to technology. The

---

<sup>3</sup> Gazi Mahabubul Alam, Abdur Rahman Forhad, and Ismi Arif Ismail, "Can Education as an 'International Commodity' Be the Backbone or Cane of a Nation in the Era of Fourth Industrial Revolution? - A Comparative Study," *Technological Forecasting and Social Change* 159 (October 1, 2020): 120184, <https://doi.org/10.1016/j.techfore.2020.120184>.

<sup>4</sup> Siti Fatonah, dkk, "Implementation Of The Independedt Curriculum Natural And Social Science Learning To Strenght Elementary Students' Independence," *Al Bidayah: Jurnal Pendidikan Islam* 15, no. 2 (2023): 203–4.

<sup>5</sup> Renis Auma Ojwala et al., "Understanding Women's Roles, Experiences and Barriers to Participation in Ocean Science Education in Kenya: Recommendations for Better Gender Equality Policy," *Marine Policy* 161 (March 1, 2024): 106000, <https://doi.org/10.1016/j.marpol.2023.106000>.

<sup>6</sup> Nuraini Soleman, "Dinamika Perkembangan Kurikulum Di Indonesia," *Foramadiahi: Jurnal Kajian Pendidikan Dan Keislaman* 12, no. 1 (2020): 4.

<sup>7</sup> Peggy Parniawski et al., "The Succession Plan: Using Competency-Based Curriculums to Educate a New Generation of Nurse Leaders," *Teaching and Learning in Nursing*, Special Issue on Evaluation, 19, no. 1 (January 1, 2024): 86–90, <https://doi.org/10.1016/j.teln.2023.09.019>.

<sup>8</sup> Zhenhua He, Lifeng Chen, and Lianqin Zhu, "A Study of Inter-Technology Information Management (ITIM) System for Industry-Education Integration," *Heliyon* 9, no. 9 (September 1, 2023): e19928, <https://doi.org/10.1016/j.heliyon.2023.e19928>.

<sup>9</sup> Hulda Halldorsdottir, Asta Thoroddsen, and Brynja Ingadottir, "Impact of Technology-Based Patient Education on Modifiable Cardiovascular Risk Factors of People with Coronary Heart Disease: A Systematic Review," *Patient Education and Counseling* 103, no. 10 (October 1, 2020): 2018–28, <https://doi.org/10.1016/j.pec.2020.05.027>.

purpose of using technology in learning is to foster motivation, learning skills, and great innovations because knowledge can be deeply explored through the internet.<sup>10</sup> In addition, digital media are expected to increase students' knowledge and skills in keeping up with the rapid development of the times.<sup>11,12</sup> This is in line with the results of the preliminary interview with the deputy head of public relations of IES Khadijah Sukorejo. It was found that, in this school, most of the learning media used are printed media in various paper materials. When students are in higher grades (4<sup>th</sup>, 5<sup>th</sup>, and 6<sup>th</sup> grade), they begin to be introduced to digital learning media.

Mathematics is a subject that aims to create intelligent individuals who can be critical and think logically.<sup>13</sup> Mathematics learning has a high level of difficulty.<sup>14,15</sup> Based on the results of the interviews, the fourth-grade students at the Islamic elementary school in Nganjuk stated that learning mathematics is difficult and it is easy to forget the material. Therefore, teachers must be able to make the mathematics learning process interesting and fun, and one of which is by integrating mathematics learning with local culture. Basically, in everyday life, culture is deeply rooted in humans while humans use mathematics to solve problems in everyday life. Therefore, culture-based mathematics learning will be a solution for students' problems in learning.<sup>16</sup>

Nganjuk Regency is one of the regencies in East Java province that has a diversity of art and tourism sector. The tourist objects in Nganjuk include Sedudo waterfall,

---

<sup>10</sup> Heri Hidayat et al., "Peranan Teknologi Dan Media Pembelajaran Bagi Siswa Sekolah Dasar Di Dalam Pembelajaran Pendidikan Kewarganegaraan," *Jurnal Pendidikan Kewarganegaraan Undiksha* 8, no. 2 (2020): 58.

<sup>11</sup> Silviana Nur Faizah, "Developing Electronic Student-Based Problem Worksheet for Primary School Student," *Al-Bidayah: Jurnal Pendidikan Dasar Islam* 13, no. 2 (2021): 408.

<sup>12</sup> Ewelina Lacka, T. C. Wong, and Mohamed Yacine Haddoud, "Can Digital Technologies Improve Students' Efficiency? Exploring the Role of Virtual Learning Environment and Social Media Use in Higher Education," *Computers & Education* 163 (April 1, 2021): 104099, <https://doi.org/10.1016/j.compedu.2020.104099>.

<sup>13</sup> Satvik M. Kusagur, Arunkumar G., and T. C. Manjunath, "Development of Mathematical Model for Smart Intelligent Flexible Structures Using Smart Intelligent Sensor & Actuator Materials Using Timoshenko Beam Theory & Its Control Using POF," *Materials Today: Proceedings*, International Conference on Newer Trends and Innovation in Mechanical Engineering: Materials Science, 37 (January 1, 2021): 648–55, <https://doi.org/10.1016/j.matpr.2020.05.630>.

<sup>14</sup> Hayatun Nufus et al., "Analyzing the Students' Mathematical Creative Thinking Ability in Terms of Self-Regulated Learning: How Do We Find What We Are Looking For?," *Heliyon* 10, no. 3 (February 15, 2024): e24871, <https://doi.org/10.1016/j.heliyon.2024.e24871>.

<sup>15</sup> Silvia Benavides-Varela et al., "Effectiveness of Digital-Based Interventions for Children with Mathematical Learning Difficulties: A Meta-Analysis," *Computers & Education* 157 (November 1, 2020): 103953, <https://doi.org/10.1016/j.compedu.2020.103953>.

<sup>16</sup> Endang Sulistyowati and Dona Ningrum Mawardi, "The Effectiveness Of Ethnomatematics Based Learning On Mathematics Ability Of Elementary School Students: A Meta-Analysis Study," *Al-Bidayah: Jurnal Pendidikan Dasar Islam* 15, no. 1 (2023): 4.

Singokromo waterfall, Watu Lawang, Roro Kuning, Bukit Surga, and many more. The art includes *wayang timplong*, *wayang kulit gandhu*, *tayub* dance, *mungdhe* dance, *salepok* dance, and *jaranan*. In addition, Nganjuk also has historic places in the form of temples, monuments, and shrines. One of the art forms that nearly becomes extinct in Nganjuk Regency is *wayang timplong*. *Wayang timplong* is a type of puppet made of wood that is chiseled flat and shaped in such a way that it resembles a leather puppet. The process of playing it is usually accompanied by traditional *gamelan* which is sourced from the local area.<sup>17</sup> The *gamelan* is produced by Nganjuk residents in Jatirejo Village, Loceret District.

An ethnomathematics study that discusses the cultural activities of a local community can be explored for the needs for classroom learning materials.<sup>18</sup> Ethnomathematics is mathematics learning that integrates local culture. The elements contained in ethnomathematics include any cultural activities, such as traditional crafts, traditional games, special foods, and local art.<sup>19</sup> Currently, ethnomathematics is still unfamiliar to the community, especially elementary school educators, because they think that learning about culture can only be included in the art and culture subject or Javanese language subject. The results of interviews with the representatives of the fourth-grade students showed that they had never watched a *wayang timplong* show during a village cleanup day and did not know that there are Javanese *gamelan* craftsmen in Nganjuk. However, they already know the plane shapes in *gamelan gong* and *wayang gunung* as a circle and triangle. Furthermore, the results of interviews and observations of the fourth-grade students and educators in Nganjuk regency showed that the mathematics learning had never been associated with the cultural elements in their area. Meanwhile, these cultural elements can be implemented in mathematics learning to help students develop in-depth understanding of the learning material and recognize the culture that exists in their area.

---

<sup>17</sup> Nur Alif Nugroho, Widya Ayu Kartikasari Pratiwi, and Rizal Gunawan, "Peran Pemerintah Terhadap Eksistensi Wayang Timplong Sebagai Kebudayaan Lokal Khas Nganjuk," *Kebijakan Dan Manajemen Publik* 5, no. 2 (2017): 13.

<sup>18</sup> Wiryanto, M. Gita Primaniarta, and José Roberto Linhares de Mattos, "Javanese Ethnomathematics: Exploration of the Tedhak Siten Tradition for Class Learning Practices," *Journal on Mathematics Education* 13, no. 4 (2022): 661–80, <https://doi.org/10.22342/jme.v13i4.pp661-680>.

<sup>19</sup> Alfonsa M Abi, "Integrasi Etnomatematika Dalam Kurikulum Matematika Sekolah," *JPMI (Jurnal Pendidikan Matematika Indonesia)* 1, no. 1 (2017): 2–4.

According to the 2013 curriculum, in the mathematics learning of the even semester for grade IV, there are basic competencies 3.9 and 4.9. The content of basic competency 3.9 is to explain and to determine the perimeter and area of squares, rectangles, and triangles and the relationship between powers of two and square roots. The basic competency 4.9 is to solve problems related to the perimeter and area of squares, rectangles, and triangles including those involving powers of two and square roots. From these basic competencies, students are expected to be able to determine and solve problems related to the perimeter and area of squares, rectangles and triangles involving the relationship between powers of two and square roots.

Plane shapes are two-dimensional shapes that have length and width and are bordered by straight lines or curved lines.<sup>20</sup> Plane shapes include squares, rectangles, and triangles. These plane shapes can have their perimeter and area calculated. The perimeter of a plane shape is defined as the total of side lengths that surround a plane shape.<sup>21</sup> The area of a plane shape is defined as the size of the area bordered by the sides of the plane shape.<sup>22</sup> Learning the plane shape material in a visual form will further improve students' understanding.

Previous studies, including The Development of Ethnomathematics-Based *Arlogy* Arithmetic Media for Learning Plane Shapes and Solid Shapes in Elementary Schools,<sup>23</sup> Development of Android-Based *Japarmatika* Media for the Characteristics of Plane Shapes in Geometry for Elementary School Students,<sup>24</sup> Development of Learning Media for the Transformation Material Using Ethnomathematics-Based I-Spring on Android,<sup>25</sup>

---

<sup>20</sup> V A Suganda, M Toybah, and S Hawa, *Buku Ajar Berbasis Hots: Pada Mata Kuliah Pembelajaran Matematika Di Kelas Rendah Sekolah Dasar* (Palembang: Bening Media Publishing, 2021).

<sup>21</sup> Gunanto and Dhesy Adhalia, *ESPS Matematika Untuk SD/MI Kelas IV Kurikulum 2013 Revisi* (Jakarta: Erlangga, 2016).

<sup>22</sup> *Ibid.*, 109

<sup>23</sup> Wiryanto Wiryanto And Saraswati Indiyanti Kusuma Dewi, "Development of Ethnomathematics-Based *Arlogy* Media for Learning Flat and Space Buildings in Elementary Schools", *Journal of Elementary School Teacher Education*, 10.08 (2022), 1726-1740.

<sup>24</sup> Wiryanto Wiryanto and Saraswati Indiyanti Kusuma Dewi, "Pengembangan Media *Arlogy* Berbasis Etnomatematika Untuk Pembelajaran Bangun Datar Dan Ruang Di Sekolah Dasar," *Jurnal Pendidikan Guru Sekolah Dasar* 10, no. 08 (2022): 1726.

<sup>25</sup> Nani Ratnaningsih, Meti Nuradriani, and Icha Sofi Nurazizah, "Pengembangan Media Pembelajaran Pada Materi Transformasi Dengan Berbantuan I-Spring Dengan Pendekatan Etnomatematika Berbasis Android," *Jurnal Jendela Pendidikan* 1, no. 02 (2021): 36.

and Development of Android-Based Mathematics Learning Media for 4<sup>th</sup> Grade of Elementary School,<sup>26</sup> have yet to specifically develop Nganjuk culture-based media.

Therefore, the researchers are interested in conducting research on the ethnomathematics elements of Nganjuk Regency. In addition, the ethnomathematics elements obtained will be developed into an ethnomathematics-based android application product. The ethnomathematics-based android application is expected to overcome the problem of students' lack of knowledge about the culture that exists in Nganjuk and problems in learning mathematics. The researchers gave a title "The Development of Amazing Nganjuk Ethnomathematics-Based Application for the Plane Shape Material for Grade IV of Islamic Elementary Schools".

## RESEARCH METHODS

The type of the research was research and development (R&D). The research was conducted to explore the ethnomathematics elements in *Nganjuk* culture while the development was carried out to produce an ethnomathematics-based android application.

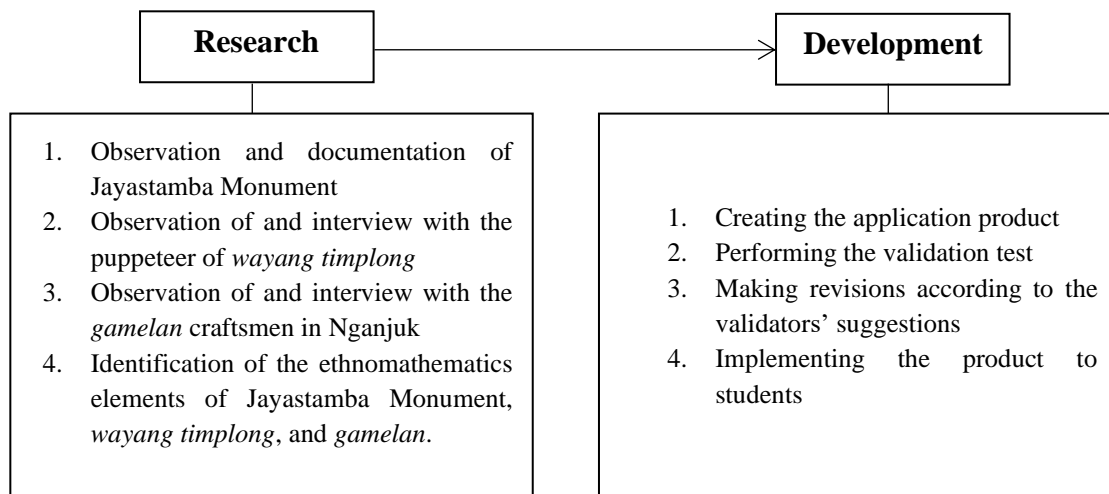


Figure 1  
R&D Procedure

Source : Personal Documents

This research-and-development was carried out using the Alessi and Trollip model which consists of three stages of planning, design, and development. The Alessi & Trollip

<sup>26</sup> Abdul Karim and Dini Savitri, "Pengembangan Media Pembelajaran Matematika Berbasis Android Di Kelas 4 Sekolah Dasar," *Jurnal Lebesgue: Jurnal Ilmiah Pendidikan Matematika, Matematika Dan Statistika* 1, no. 2 (2020): 63.

development model is a structured software development model.<sup>27</sup> The planning stage was carried out by defining the scope, identifying the characteristics of students, collecting supporting resources, and brainstorming with the class teachers. The design stage was carried out by analyzing the concepts, making flowcharts, and designing the display. The development stage was carried out by making the product, conducting the alpha test with media experts and material experts, making revisions according to the suggestions and responses from the validators, and conducting the beta test.<sup>28</sup> The details of the model can be seen in Figure 2.

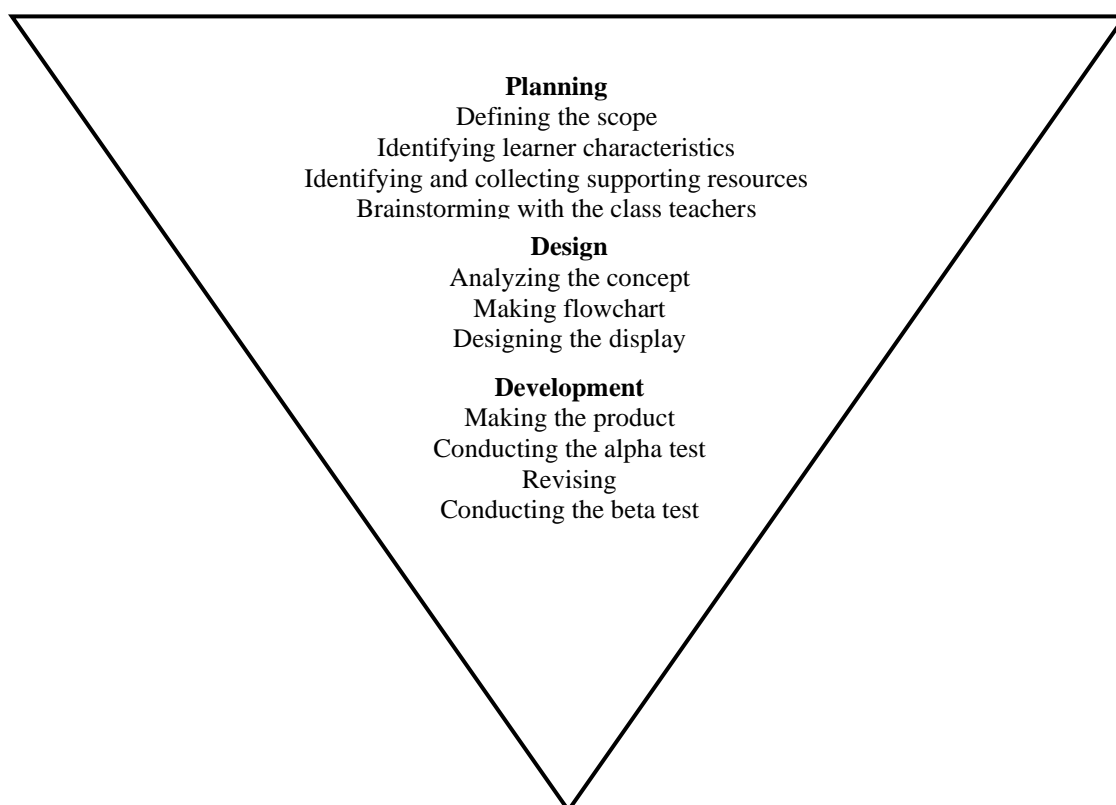


Figure 2  
Alessi and Trollip Development Model  
Source :<sup>29</sup>

The product developed in this research was an android application based on ethnomathematics for the plane shape material for grade IV of elementary school. The

---

<sup>27</sup> Alessi and Stephen M, *Multimedia for Learning* (Needham Height: Massaschusetts A Pearson Education Company, 2001).

<sup>28</sup> Wendy Ardiyanti, Sani Safitri, and L R Retno Susanti, "Pengembangan Media Pembelajaran Menggunakan Windows Movie Maker Pada Mata Pelajaran Sejarah Kelas Xi Sekolah Menengah," *Criksetra: Jurnal Pendidikan Sejarah* 8, no. 1 (2019): 65.

<sup>29</sup> Alessi and Stephen M, *Multimedia for Learning* (Needham Height: Massaschusetts A Pearson Education Company, 2001)

android application developed was named "*Amazing Nganjuk*" with the aim of providing knowledge to students about the culture that exists in Nganjuk Regency and its relationship with the plane shape material. The samples in this study were selected through a saturated sampling technique. Therefore, all the members of the population, with a total of 50 students, became the samples in the study. The subject of the alpha test in this research and development consisted of 2 media experts and 2 material experts. Meanwhile, the beta test respondents who provided responses to the produced learning media were the students from class IV-A and IV-B of IES Khadijah Sukorejo Loceret.

The research data was obtained from the interviews with puppeteers and *gamelan* craftsmen, surveys during the alpha test and beta test, as well as observation and documentation of Nganjuk cultural elements. The instruments used in this study included observation sheets, interview guidelines, and questionnaires. The observation sheets and interview guidelines were used to obtain data about Jayastamba monument, *wayang timplong*, and *gamelan* while the questionnaires were used to obtain data on the alpha test and beta test.

The alpha test instrument consisted of a validation questionnaire for material experts and media experts. The material validation was carried out by two experts, a mathematics lecturer and grade IV elementary school teacher. The media validation was carried out by two experts in the field of information technology-based media. The media validation sheets were made based on the indicators from the National Education Standards Agency listed in Table 1. Meanwhile, the material validation sheet was made based on the Cunningsworth's indicators listed in Table 2. The beta test instrument in this study consisted of questionnaires of students' responses to the resulting learning media, listed in Table 3.

Table 1  
Media Validation Questionnaire Grid

Aspect	Indicators	Number of Items
Display	Clarity & neatness of the images	1
	Media safety	1
	Clarity of the clues	1
Content of Material	Conformity with the basic competencies & core competencies	1
	Conformity with the learning topics	1
	Media practicality & durability	1



Aspect	Indicators	Number of Items
Color	Media quality	1
	Suitability & Attractiveness of the colors	2

Source : BSNP

Table 2  
Material Expert Questionnaire Grid

Aspect	Indicators	Number of Items
Goals and Approach	Conformity with the Core Competencies and Basic Competencies	1
	Conformity with the learning objectives	1
	Conformity with the learning situation	1
Topic	Material attractiveness	1
	Conformity of the material with the culture	2
Language	Suitability of the language	2

Source : Cunningsworth's indicators

Table 3  
Student Response Questionnaire Grid

Aspect	Indicators	Number of Items
Language	Ease of use of the language	2
Programming	Attractiveness of the media use	1
	Attractiveness of the menu display	1
Appearance	Attractiveness of the background, pictures, and videos	2
Implementability	Attractiveness for learning	1
	Ease of use	1

Source : BSNP

The data in the alpha test and beta test was then analyzed as follows. The research results of the alpha test from the material experts and media experts were analyzed using a 1-5 Likert scale. Next, the validation results were calculated using the formula<sup>30</sup>:

$$P = \frac{Xi}{X} \times 100$$

Note:

- P = percentage
- Xi = total score obtained
- X = maximum score

After that, the percentage was categorized into very feasible (81.25% < x ≤ 100%), feasible (62.50% < x ≤ 81.25%), less feasible (43.75% < x ≤ 62.50%), and not feasible

<sup>30</sup> A Kurniawan et al., *Evaluasi Pembelajaran* (Get Press, 2022).

( $25\% < x \leq 43.75\%$ ). After the appropriate category was obtained, the product was ready to be used in the beta test. The data obtained from the beta test of students' responses was analyzed using the Guttman scale. The Guttman scale is a scale that contains only one dimension with affirmative answers. The answer to this statement consists of "yes" and "no". If the answer given is "yes" then the score is 1 and if "no" then the score is 0. The categorization of the beta test scores is shown in Table 4.

Table 4  
Beta Test Score Interpretation Criteria<sup>31</sup>

Percentage	Criteria
81% - 100%	Strongly agree
61% - 80%	Agree
41% - 60%	Quite disagree
21% - 40%	Disagree
0% - 20%	Strongly disagree

Source: Riduwan. (2015). *Belajar Mudah Penelitian Untuk Guru-Karyawan dan Peneliti Pemula*. Bandung: Alfabeta

## RESULTS AND DISCUSSION

The type of research conducted was research and development (R&D) using the Alessi and Trollip model. The Alessi and Trollip model is a research and development framework utilized for the purpose of researching and creating mobile learning applications. This approach has been used in multiple research endeavors to develop adaptable mobile learning applications and evaluate their influence on educational achievements.<sup>32</sup> In the context of mobile learning, the Alessi and Trollip model can be used to design and develop mobile learning applications; the model offers a systematic methodology for the planning, design, and development of mobile learning applications, guaranteeing that they fulfil user requirements and enhance the overall quality of learning experiences.<sup>33</sup> Create adaptive mobile learning; the concept enables the development of adaptive mobile learning applications that dynamically adapt to users' needs and

<sup>31</sup> Sarip Hidayat, "Pengembangan Media Pembelajaran Berbasis Android Untuk Mahasiswa Pada Materi Elektrokimia" (Jakarta, 2017).

<sup>32</sup> Ence Surahman and Walid Fajar Antariksa, "Adaptive Mobile Learning Application As An Innovative Learning Media To Support The Quality Of Blended Learning Process" (EAI, 2020), <https://doi.org/10.4108/eai.2-10-2018.2295454>.

<sup>33</sup> H Rahim and N Che Dom, "Design and Development of Mobile Application Based on Proactive Elements of Safety Culture Framework for the Oil and Gas Industry: A Conceptual Framework," *IOP Conference Series: Earth and Environmental Science* 1151, no. 1 (March 2023): 012033, <https://doi.org/10.1088/1755-1315/1151/1/012033>.

preferences, offering a customized learning experience.<sup>34</sup> Evaluate mobile learning applications; the approach can be utilized to analyze the efficacy of mobile learning applications by evaluating their usability, navigation, and overall learning outcomes.

This paradigm comprises multiple stages, including planning, design, and development. In the planning stage, one must determine the learning objectives, target audience, and necessary resources for the project. The design phase entails the development of a comprehensive blueprint for the project, encompassing the instructional methodologies, material, and evaluation methods. In the development stage, the focus is on producing the tangible learning materials, such as multimedia content, and conducting tests to assess the usability and effectiveness of the application.<sup>35,36</sup> The Research Stage was conducted to explore the ethnomathematics elements in Nganjuk culture while the Development Stage was carried out to develop an ethnomathematics-based android application product.

The research stage was carried out to collect data related to the ethnomathematics elements in Nganjuk culture. This ethnomathematics data was collected directly from the government of Nganjuk Regency and Nganjuk craftsmen and artists. The ethnomathematics elements in Nganjuk culture are as follows the Jayastamba monument is an icon of Nganjuk Regency built on the Ahmad Yani crossroads. The word "jaya" means victory or glory while "stamba" means monument or pillar. The origin of this monument was taken from a Jayastamba inscription found in Lor temple.



Figure 3  
Ethnomathematics of Jayastamba Monument  
Source : Personal Documents

---

<sup>34</sup> Surahman and Antariksa, "Adaptive Mobile Learning Application As An Innovative Learning Media To Support The Quality Of Blended Learning Process."

<sup>35</sup> Siswadi Perdana Putra et al., "Development of Android-Based Chemistry Learning Media for Experimenting," *Journal of Physics: Conference Series* 1422 (2020): 12037, <https://doi.org/10.1088/1742-6596/1422/1/012037>.

<sup>36</sup> Barbara A. Frey and Jann Marie Sutton, "A Model for Developing Multimedia Learning Projects," *JOLT - Journal of Online Learning and Teaching* 6, no. 2 (2020).

Based on the results of observation and documentation, it was found that the Jayastamba monument has a rectangular plane shape in the center. This is in accordance with the research entitled Ethnomathematics Potential to Develop Mathematical Communication Skills, which showed that in the Waseso monument there is a mathematics element in the form of circular plane shape on the base and roof.<sup>37</sup>

*Wayang Timplong* is puppets made of wood. It was originally created by Mbah Banjol who lived in Jatis Village, Pace District. In several villages in Nganjuk Regency, this puppet is performed at the village cleanup events.



Figure 4  
Ethnomathematics of *Wayang Timplong*  
Source : Personal Documents

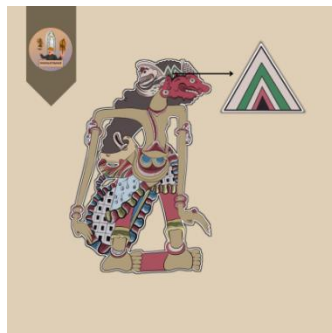


Figure 5  
Ethnomathematics of *Wayang Timplong*  
Source : Personal Documents

Based on the results of observation and documentation, it was found that the clothes worn by *timplong* puppets have a square motif, and on the head of *timplong* puppets there is a triangular plane shape. This is in accordance with the research entitled Exploration of the Ethnomathematics of the Bung Karno Tomb Complex in Culture-

---

<sup>37</sup> Suryandaru Prasetyo Jati, Zaenuri Mastur, and Mohammad Asikin, "Potensi Etnomatematika Untuk Mengembangkan Kemampuan Komunikasi Matematis," in *PRISMA, Prosiding Seminar Nasional Matematika*, vol. 2, 2019, 282.

Based Mathematics Learning. The results showed that at the top of the *gunungan* of leather puppets there is a mathematics element of triangular plane shape.<sup>38</sup>

*Gender* and *demung* are two *gamelan* instruments that accompany *wayang timplong* performances. In Nganjuk Regency, there is a *gamelan* maker living in Jatirejo village, Loceret sub-district.

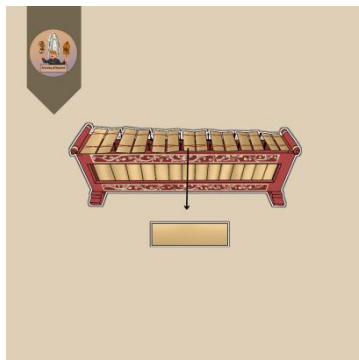


Figure 6  
Ethnomathematics of *Gamelan Gender*  
Source : Personal Documents

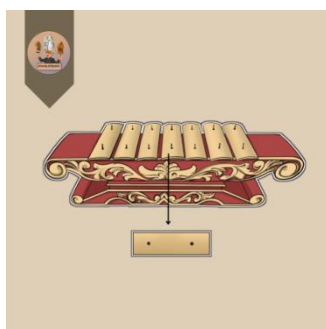


Figure 7  
Ethnomathematics of *Gamelan Demung*  
Source : Personal Documents

In the *gamelan* named *gender* and *demung*, there is a rectangular plane shape on the gold iron. This is in accordance with the research entitled Exploration of Mathematics in Javanese *Gamelan* as a Media for Learning Mathematics. The results showed that, in the frame used to put the *gamelan bonang* on, there is a mathematics element of rectangular plane shape.<sup>39</sup>

---

<sup>38</sup> Asfira Zakiatun Nisa and Imam Rofiki, "Exploration of the Ethnomathematics of the Bung Karno Tomb Complex in Cultural Based Mathematics Learning," *Journal of Mathematics Education IKIP Veteran Semarang* 6, no. 1 (2022): 114.

<sup>39</sup> Ary Purmadi and Kholisus Sa'di, "Pengembangan Kelas Virtual Berbasis Moodle Untuk Memfasilitasi Efektivitas Pembelajaran Siswa Di Sekolah Dasar," *Jurnal Inovasi Dan Teknologi Pembelajaran (JINOTEP): Kajian Dan Riset Dalam Teknologi Pembelajaran* 8, no. 1 (2021): 14.

The development of the Amazing Nganjuk application was carried out through three stages, including planning, design, and development. In the planning stage, the first step was to define the scope of the material, which was plane shapes. Second, the identification of the characteristics of the students in grade IV of IES Khadijah Sukorejo Loceret indicated that they considered mathematics difficult, they had used the Google form in smartphones, the higher classes had begun to be introduced to digital learning media, and they had never learned mathematics connected to the culture of Nganjuk Regency. Third, the identification of the supporting resources included collecting plane shape material from several book sources, making observations on puppeteers and *gamelan* craftsmen to obtain documents of *wayang timplong* and *gamelan*, looking for photos and videos of some types of culture in Nganjuk Regency on the internet, and looking for images on the internet to design the buttons on the application to be developed. This is in accordance with the research entitled Development of a Moodle-Based Virtual Classroom to Facilitate the Effectiveness of Student Learning in Elementary Schools. The research-and-development was carried out in the Alessi and Trollip model with three stages of planning, design, and development. The planning stage was done by defining the field/scope, identifying student characteristics, and determining and collecting supporting resources as well as brainstorming.<sup>40</sup>

At the design stage, the steps taken were analyzing the concept of the existing arrangement in the application, making a flowchart to show an overview of the program structure, and creating a storyboard to describe the sequence and design used in the application to be developed. This is in accordance with the research entitled Development of Interactive Digital Book of Mathematics on Geometry Material. At the design stage, a flowchart was made to explain the process of running an interactive digital book. Then, storyboards were created to provide an overview of the interactive digital book developed.<sup>41</sup>

In the development stage, the first step was to create a product by drawing Jayastamba monument, *wayang timplong*, and *gamelan gender* and *demung* using the clip studio software.

---

<sup>40</sup> Purmadi and Sa'di.

<sup>41</sup> Marselina Vince and Ali Muhtadi, "Pengembangan Buku Digital Interaktif Matematika Pada Materi Geometri," *Jurnal Inovasi Teknologi Pendidikan* 6, no. 2 (2019): 202.

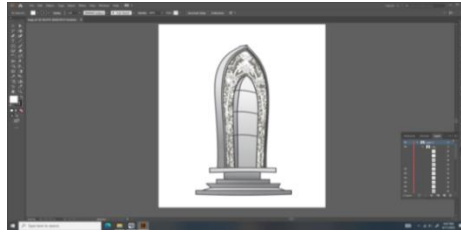


Figure 8  
Drawing the Jayastamba Monument in Clip Studio  
Source : Personal Documents

The results of some of these images were combined to create the application logo and other supporting images with the help of the PixelLab application.

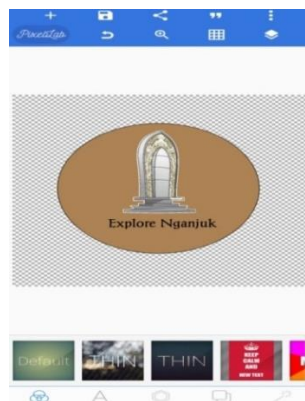


Figure 9  
Creating Logo and Button Designs in PixelLab  
Source : Personal Documents

Next, a background was created to be used in the application with the help of the Canva application.

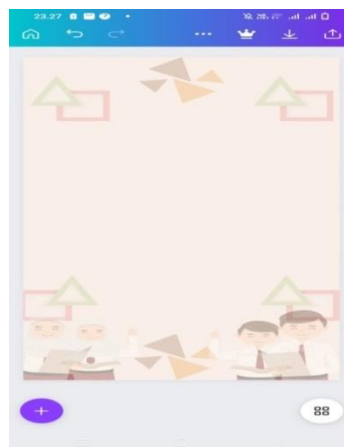

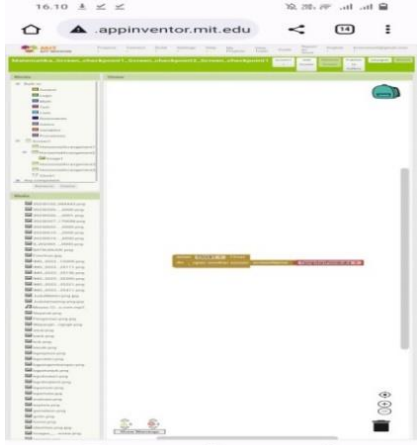


Figure 10  
Creating a Background Design in Canva  
Source : Personal Documents

The images, logos, and backgrounds created were used to produce an android application in the MIT App Inventor. The process in the MIT App Inventor started with making a design according to the storyboard previously made, and the design results were arranged in blocks to allow the android application developed to run according to the previously designed program. A study entitled Developing an Android-Based Mobile GIS Application for the Tourism Information in Gunungkidul Regency showed that the preparation of blocks in the MIT App Inventor was done with a drag and drop system according to the logic of each step.<sup>42</sup> The details of the Block Preparation in the MIT App Inventor can be seen in Table 5.

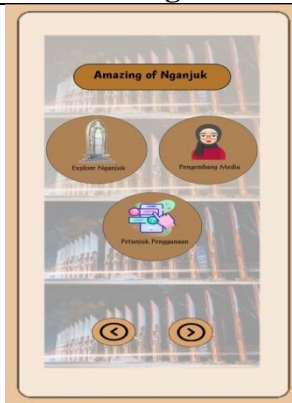
Table 5  
Design and Block of the Application Development in the MIT App Inventor

Design	Block
	
<p>On the splash screen, a logo is chosen with a combination of the images of Jayastamba monument and <i>dalang</i>, representing the Jayastamba monument as the icon of Nganjuk Regency and <i>dalang</i> as a person who plays the <i>timplong</i> puppet show. The name of the application is <i>Amazing Nganjuk</i> with the aim of introducing users to Nganjuk as an extraordinary regency with a variety of culture. In addition, on the edge, there are images of plane shapes and elementary school students as a sign that the material in the application is plane shapes for elementary school.</p>	<p>The above image is a block flow to display the splash screen. The arrangement of the block display on the splash screen is "when do open another screen-screen name Tampilan Pembuka-clock timer". The purpose of the block arrangement is to allow immediate shift to the opening display when users open the splash screen display.</p>

<sup>42</sup> Rizki Putra Agrarian, Andri Suprayogi, and Bambang Darmo Yuwono, "Pembuatan Aplikasi Mobile Gis Berbasis Android Untuk Informasi Pariwisata Di Kabupaten Gunungkidul," *Jurnal Geodesi Undip* 4, no. 2 (2015): 247.

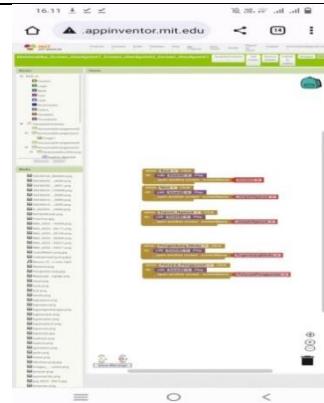


## Design



In the opening display section, there is an Explore Nganjuk button, media developer, and instructions for use as well as back and continue buttons. The Explore Nganjuk button is made with the Jayatamba monument design with the aim of enabling users to see some types of culture in Nganjuk if they click the button. In addition, the media developer button is designed with a picture of a woman wearing hijab, indicating that the media developer is a Muslim woman from Nganjuk. By pressing the media developer button, users can find out the identity of the application's media developer. The “instructions for use” button aims to give directions to users on how to use the *Amazing Nganjuk* application.

## Block

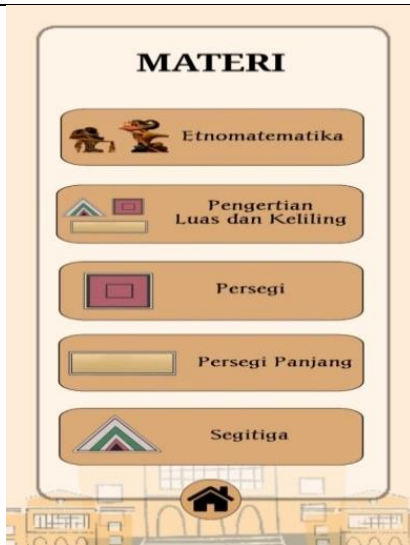


The image is a block arrangement to organize the opening display in the application. The block arrangement in the opening display is:

1. *"when do back click-call sound1 play-open another screen screen Name screen2"*. The purpose of the block flow is to display a sound and return to screen2 when the user presses the back button.
2. *"when do next click-call sound1 play-open another screen screenName Jelajah Nganjuk"*. The aim of the block flow is to play a sound and open the Jelajah Nganjuk display when the user presses the back button.
3. *"when do Explore\_Nganjuk click-call sound1 play-open another screen screen screenName Jelajah Nganjuk"*. The purpose of the block flow is to play a sound and open the Explore Nganjuk display when the user presses the Explore Nganjuk button.
4. *"when do Pengembang\_Media click-call sound1 play-open another screen screenName Pengembang\_Media"*. The purpose of the block flow is to play a sound and open the Media Developer view when the user pressed the Media Developer button.
5. *"when do Petunjuk\_Penggunaan click-call sound1 play-open another screen screenName Jelajah Nganjuk"*. The purpose of the block flow is to play a sound and open the Instructions for

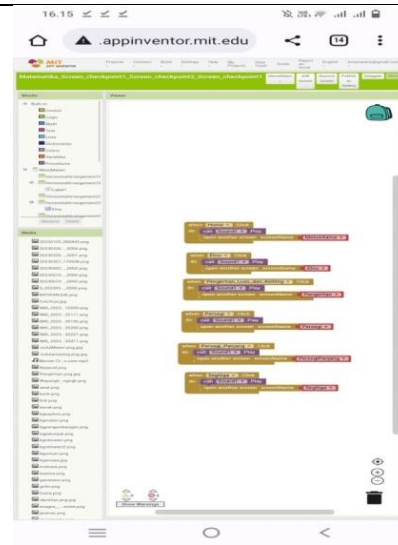
**Design****Block**

Use display when the user presses the Instructions for Use button.



Picture x

In the material display section, the design displays the ethnomathematics menu button, definitions of area and perimeter button, as well as square, rectangle, and triangle buttons. The ethnomathematics button is designed with a puppet image as one of the culture forms in Nganjuk. By pressing the ethnomathematics button, users can find out the cultural elements in Nganjuk and their relationship with plane shapes. Furthermore, the “area and perimeter definition” button is designed with the presentation of plane shapes in Nganjuk culture. By pressing this button, users can go to the definitions of the area and perimeter of plane shapes. The square, rectangle, and triangle buttons are designed with the plane shapes taken from several elements of Nganjuk culture, such as triangles and squares in *wayang timplong* and rectangles in *gamelan*. In addition, there is also a home button that is useful for returning to the main menu display.

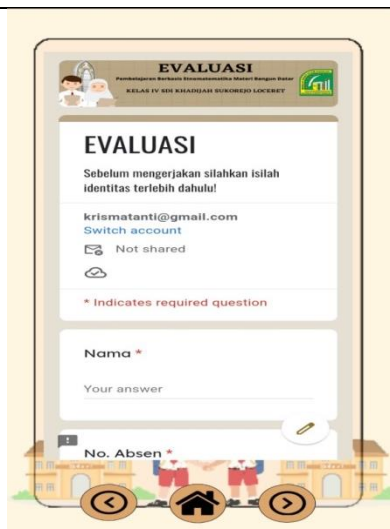


Picture x

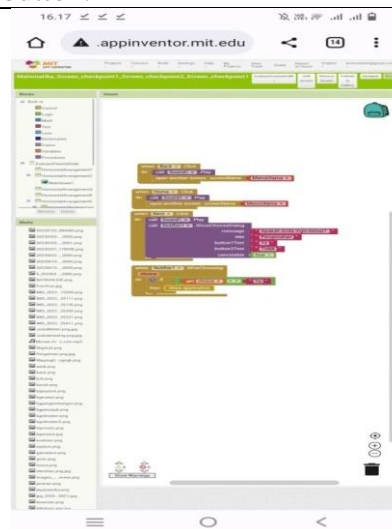
The picture is an arrangement of blocks made by the application developer to organize the course of the material menu display. The order of the course made on the material menu is:

1. *"when do Home click-call sound1 play-open another screen screenName Menu Utama"*. The purpose of the block flow is to play a sound and return to the main menu when the user presses the Home button.
2. *"when do Etno click-call sound1 play-open another screen screenName Etno"*. The purpose of the block flow is to play a sound and open the Etno display when the user presses the Etno button.
3. *"when do Pengertian\_Luas\_dan\_Keliling click-call sound1 play-open another screen screenName Pengertian"*. The purpose of the block flow is to play a sound and open the display of the definitions of the area and perimeter of plane shapes when the user presses the Definition of Area and Perimeter button.

Design	Block
	<p>4. "when do Persegi click-call sound1 play-open another screen screenName Persegi". The purpose of the block flow is to play a sound and open the square material display when the user presses the Square button.</p> <p>5. "when do Persegi_Panjang click-call sound1 play-open another screen screenName Persegi Panjang". The purpose of the block flow is to play a sound and open the rectangle material display when the user presses the Rectangle button.</p> <p>6. "when do Triangle click-call sound1 play-open another screen screenName Triangle". The aim of the block flow is to play a sound and open the triangle material display when the user presses the Triangle button.</p>



The evaluation display part is designed by connecting it to Google form. In addition, there are continue and return buttons. The continue button is used to continue or end the session because it has reached the final step, namely completing the evaluation, while the back button is used to return to the previous display.



The image is an arrangement of blocks made by the application developer to organize the course of the evaluation display. At the design stage in MIT App Inventor, this evaluation section has been connected to Google form. The block arrangement made by the developer is:

1. "when do back click-call sound1 play-open another screen screenName Main Menu". The purpose of the block flow is to play a sound and

Design	Block
	<p>return to the main menu when the user presses the "back" button.</p> <p>2. <i>"when do Home click-call sound2 play-open another screen screenName Main Menu"</i>. The aim of the block flow is to play a sound and return to the main menu when the user presses the Home button.</p> <p>3. <i>"when do Next click-call sound1 play-call Notifier1.ShowChooseDialog message "Do You Want to Exit"-title "Authorization"-button1Text "Yes"-button2Text "No"-cancelable true"</i>. The purpose of the block arrangement is to play a "click" sound and display a notification "Do You Want to Exit?" with is a choice between "Yes" or "No" when the user presses the "Next" button.</p> <p>4. <i>"when Notifier1 AfterChoosing choice do if get choice = Yes- then close the application"</i>. The aim of the block arrangement is to allow the user to exit the application when the "Do You Want to Exit" notification appears and the user presses the "Yes" button.</p>

Source : Personal Documents

After the block preparation was complete, the step of building the application was done by clicking the build button on the MIT App Inventor and waiting for the loading to reach 100%. Next, a barcode and download icon appeared to allow the download of the application produced and to make it available for use on an android smartphone.

After completion, the ethnomathematics-based android application product was ready to be tested at the alpha test stage by media experts and material experts. The purpose of alpha test is to obtain assessments and suggestions from media and material validators regarding the application products that have been developed. The media expert who conducts the validation is a lecturer with a background in informatics engineering education or who teaches learning technology courses. In this study, the validation was carried out by the lecturers from the Faculty of Tarbiyah IAIN Kediri. The results of the assessment from the media expert validator can be seen in Table 6.

Table 6  
Results of Media Validation Alpha Test

Validator's Name	Percentage	Category
Validator 1	92 %	Very feasible
Validator 2	100 %	Very feasible
Average	96 %	Very feasible

Source : Personal Documents

Table 7  
Media Expert Validation Comments and Suggestions

Validator's Name	Criticism and Suggestion
Validator 1	<ol style="list-style-type: none"> <li>1. The font should be made uniform in 3 parts:                             <ol style="list-style-type: none"> <li>a. Title</li> <li>b. Subtitle</li> <li>c. Content</li> </ol> </li> <li>2. The Home button in the material is missing</li> </ol>
Validator 2	<ol style="list-style-type: none"> <li>1. Good</li> <li>2. Revision of images and buttons on the Explore Nganjuk menu</li> <li>3. Add home button and arrow on the main menu</li> </ol>

Source : Personal Documents

From Table 6, it is known that the ethnomathematics-based android application developed received an average score of 96% with the category "Very Feasible" for use in learning the plane shape material in mathematics for grade IV.

Furthermore, the material expert who validated the application media developed is a Tadris Mathematics lecturer and grade IV elementary school teacher. The results of the assessment of the material expert validator can be seen in Table 10.

Table 8  
Results of Material Validation Alpha Test

Validator's Name	Percentage	Category
Validator 3	90.00 %	Very feasible
Validator 4	97.50 %	Very feasible
Average	93.75 %	Very feasible

Source : Personal Documents

Table 9  
Material Expert Validation Comments and Suggestions

Validator's Name	Criticism and Suggestion
Validator 3	<ol style="list-style-type: none"> <li>1. Basic Competency 4.9 material, problems, and square root problems</li> <li>2. Consider email on Google form</li> <li>3. Provide contact number on the developer's profile</li> <li>4. Improve the instructions for use</li> </ol>

Validator's Name	Criticism and Suggestion
Validator 4	The pictorial material should be made clearer, such as the puppet picture on the box should be made clearer.

Source : Personal Documents

From Table 8, it is known that the material contained in the ethnomathematics-based android application media developed received an average percentage score of 93.75% with the category "Very Feasible" to be used in the learning of plane shape material in mathematics for grade IV. This is supported by the research entitled Development of Interactive Multimedia Learning Media for Ethnomathematics-Based Traditional Cookware. The results of the research conducted showed that the developed media was valid for use in learning with a media validation percentage of 91.6% and material validation of 86.6%.<sup>43</sup>

After the assessments and suggestions from the validators in the alpha test, the product was revised according to the suggestions given. After successful revision, the ethnomathematics-based android application product was ready to be tested at the beta test stage with the respondents from class IV of Islamic elementary school. There were 50 students who carried out the beta test. Before carrying out the trial, the researchers gave instructions to the students regarding how to use the Amazing Nganjuk application. Next, the students used the Amazing Nganjuk application media together with their groups and carried out the evaluations individually. After the students finished working on the evaluation questions, they were given a questionnaire to provide responses to the application media that had been used. The Beta test results can be seen in Table 10.

Table 10  
Beta Test Results of Class IV Student Respondents

Respondents	Percentage	Category
Class IV-A	99%	Strongly Agree
Class IV-B	95%	Strongly Agree
Average	97%	Strongly Agree

Source : Personal Documents

From table 3, it is known that the respondents of class IV-A and IV-B of IES Khadijah Sukorejo Loceret gave an average percentage of 97% with a category of strongly agree with the use of the ethnomathematics-based Amazing Nganjuk application

<sup>43</sup> Ahmad Faqih, Odi Nurdiawan, and Andi Setiawan, "Pengembangan Media Pembelajaran Multimedia Interaktif Alat Masak Tradisional Berbasis Etnomatematika," *Mosharafa: Jurnal Pendidikan Matematika* 10, no. 2 (2021): 301.

for learning the plane shape material. This is in accordance with the research entitled Wonderful Nganjuk Application Development, which found that the student activity in learning was very good, and they could successfully complete the learning.<sup>44</sup> This is also in line with the effectiveness of ethnomathematics-based learning in improving students' mathematical abilities.<sup>45</sup> Integrating culture into mathematics learning makes it easier for students to understand.<sup>46</sup> An ethnomathematics approach is better than the students' attitude before learning about fractions using an ethnomathematics approach.<sup>47,48</sup>

## CONCLUSION

Based on the results of the research and discussion, it can be concluded that the elements of ethnomathematics in Nganjuk culture include a rectangular plane shape in the center of Jayastamba monument, a triangular plane shape on the head and a square plane shape on the shirt of *wayang timplong*, and a rectangular plane shape on the golden iron of *gamelan gender* and *demung*. The development of the Amazing Nganjuk application was carried out using the Alessi and Trollip model in three stages of planning, design, and development. In the alpha test by the material experts and media experts, the average percentage of feasibility was 93.75% with a very feasible category and 96% with a very feasible category, respectively. In addition, in the beta test with the respondents from class IV of Islamic elementary school totaling 50 students, an average percentage of 97% was obtained in the category of strongly agree. The Amazing Nganjuk application can be used as a companion learning media in the learning of plane shape material for grade IV of elementary school. It is expected that this application can facilitate educators in introducing the culture that exists in Nganjuk Regency and taking the elements of plane shapes. This application is equipped with a Learning Implementation Plan (RPP) and a

---

<sup>44</sup> Santi Kusuma Dewi, "Pengembangan Aplikasi Berbasis Android 'Wonderful Nganjuk,'" *Jurnal Guru Dikmen Dan Dikus* 6, no. 1 (2023): 34.

<sup>45</sup> Sulistyowati And Mawardi, "The Effectiveness Of Ethnomatematics Based Learning On Mathematics Ability Of Elementary School Students: A Meta-Analysis Study."

<sup>46</sup> Ubiratan D'Ambrosio and Milton Rosa, "Ethnomathematics and Its Pedagogical Action in Mathematics Education," *Ethnomathematics and Its Diverse Approaches for Mathematics Education*, 2017, 285–305.

<sup>47</sup> Linda Indiyarti Putri, "Eksplorasi Etnomatematika Kesenian Rebana Sebagai Sumber Belajar Matematika Pada Jenjang MI," *Jurnal Ilmiah Pendidikan Dasar* 4, no. 1 (2017): 22–23.

<sup>48</sup> Linda Indiyarti Putri, Nurwidiyanto Nurwidiyanto, and Alfiana Rohmah, "The Development Of Fraction Textbook With The Ethnomathematics Approach For Third Grade Student Of Madrasah Ibtidaiyah," *Al-Bidayah: Jurnal Pendidikan Dasar Islam* 12, no. 2 (April 2021): 165–82, <https://doi.org/10.14421/al-bidayah.v12i2.535>.

summary of material about the area and perimeter of plane shapes to facilitate the use of media. The product that the researchers have developed can be accessed without being limited by place and time, but it can only be used on smartphones. It is recommended that the product is further developed to enable access via tablets and computers, thus facilitating better access for users.

## ACKNOWLEDGMENTS

The researchers thank all the lecturers and students of Education for Islamic Elementary School Teachers Programme, Islamic State Institute Kediri and the big family of IES Khadijah Sukorejo Loceret who have provided a place, time, and assistance in the process of conducting this research.

## DECLARATION OF CONFLICTING INTERESTS


In the preparation of this article, the authors have no conflicts or conflicts of interest during the research activities.

## FUNDING

In completing this article, the author did not receive any research grants.

## ORCID

Yusi Krisma Tanti  -

Choirul Annisa  -

Puspoko Ponco Ratno  -

## REFERENCES

Abi, Alfonsa M. "Integrasi Etnomatematika Dalam Kurikulum Matematika Sekolah." *JPMI (Jurnal Pendidikan Matematika Indonesia)* 1, no. 1 (2017): 2–4.

Agrarian, Rizki Putra, Andri Suprayogi, and Bambang Darmo Yuwono. "Pembuatan Aplikasi Mobile Gis Berbasis Android Untuk Informasi Pariwisata Di Kabupaten Gunungkidul." *Jurnal Geodesi Undip* 4, no. 2 (2015): 247.

Alam, Gazi Mahabubul, Abdur Rahman Forhad, and Ismi Arif Ismail. "Can Education as an 'International Commodity' Be the Backbone or Cane of a Nation in the Era of Fourth Industrial Revolution? - A Comparative Study." *Technological Forecasting and Social Change* 159 (October 1, 2020): 120184. <https://doi.org/10.1016/j.techfore.2020.120184>.



- Alessi, and Stephen M. *Multimedia for Learning*. Needham Height: Massaschusetts A Pearson Education Company, 2001.
- Alpian, Yayan, Sri Wulan Anggraeni, Unika Wiharti, and Nizmah Maratos Soleha. "Pentingnya Pendidikan Bagi Manusia." *Jurnal Buana Pengabdian* 1, no. 1 (2019): 67–68.
- Ardiyanti, Wendy, Sani Safitri, and L R Retno Susanti. "Pengembangan Media Pembelajaran Menggunakan Windows Movie Maker Pada Mata Pelajaran Sejarah Kelas Xi Sekolah Menengah." *Criksetra: Jurnal Pendidikan Sejarah* 8, no. 1 (2019): 65.
- Benavides-Varela, Silvia, Claudio Zandonella Callegher, Barbara Fagiolini, Irene Leo, Gianmarco Altoè, and Daniela Lucangeli. "Effectiveness of Digital-Based Interventions for Children with Mathematical Learning Difficulties: A Meta-Analysis." *Computers & Education* 157 (November 1, 2020): 103953. <https://doi.org/10.1016/j.compedu.2020.103953>.
- D'Ambrosio, Ubiratan, and Milton Rosa. "Ethnomathematics and Its Pedagogical Action in Mathematics Education." *Ethnomathematics and Its Diverse Approaches for Mathematics Education*, 2017, 285–305.
- Dewi, Santi Kusuma. "Pengembangan Aplikasi Berbasis Android 'Wonderful Nganjuk.'" *Jurnal Guru Dikmen Dan Dikus* 6, no. 1 (2023): 34.
- Faizah, Silviana Nur. "Developing Electronic Student-Based Problem Worksheet for Primary School Student." *Al-Bidayah: Jurnal Pendidikan Dasar Islam* 13, no. 2 (2021): 408.
- Faqih, Ahmad, Odi Nurdiawan, and Andi Setiawan. "Pengembangan Media Pembelajaran Multimedia Interaktif Alat Masak Tradisional Berbasis Etnomatematika." *Mosharafa: Jurnal Pendidikan Matematika* 10, no. 2 (2021): 301.
- Fatonah, dkk, Siti. "Implementation Of The Independedt Curriculum Natural And Social Science Learning To Strenght Elementary Students' Independence." *Al Bidayah: Jurnal Pendidikan Islam* 15, no. 2 (2023): 203–4.
- Frey, Barbara A., and Jann Marie Sutton. "A Model for Developing Multimedia Learning Projects." *JOLT - Journal of Online Learning and Teaching* 6, no. 2 (2020).
- Gunanto, and Dhesy Adhalia. *ESPS Matematika Untuk SD/MI Kelas IV Kurikulum 2013 Revisi*. Jakarta: Erlangga, 2016.
- Halldorsdottir, Hulda, Asta Thoroddsen, and Brynja Ingadottir. "Impact of Technology-Based Patient Education on Modifiable Cardiovascular Risk Factors of People with Coronary Heart Disease: A Systematic Review." *Patient Education and Counseling* 103, no. 10 (October 1, 2020): 2018–28. <https://doi.org/10.1016/j.pec.2020.05.027>.
- He, Zhenhua, Lifeng Chen, and Lianqin Zhu. "A Study of Inter-Technology Information Management (ITIM) System for Industry-Education Integration." *Heliyon* 9, no. 9 (September 1, 2023): e19928. <https://doi.org/10.1016/j.heliyon.2023.e19928>.
- Hidayat, Heri, Heny Mulyani, Sri Devi Nurhasanah, Wilma Khairunnisa, and Zakitush Sholihah. "Peranan Teknologi Dan Media Pembelajaran Bagi Siswa Sekolah

- Dasar Di Dalam Pembelajaran Pendidikan Kewarganegaraan.” *Jurnal Pendidikan Kewarganegaraan Undiksha* 8, no. 2 (2020): 58.
- Hidayat, Sarip. “Pengembangan Media Pembelajaran Berbasis Android Untuk Mahasiswa Pada Materi Elektrokimia.” Jakarta, 2017.
- Jati, Suryandaru Prasetyo, Zaenuri Mastur, and Mohammad Asikin. “Potensi Etnomatematika Untuk Mengembangkan Kemampuan Komunikasi Matematis.” In *PRISMA, Prosiding Seminar Nasional Matematika*, 2:282, 2019.
- Karim, Abdul, and Dini Savitri. “Pengembangan Media Pembelajaran Matematika Berbasis Android Di Kelas 4 Sekolah Dasar.” *Jurnal Lebesgue: Jurnal Ilmiah Pendidikan Matematika, Matematika Dan Statistika* 1, no. 2 (2020): 63.
- Kurniawan, A, A N Febrianti, T Hardianti, R Risan, D M M Sari, J W Sitopu, R S Dewi, and D Sianipar. *Evaluasi Pembelajaran*. Get Press, 2022.
- Kusagur, Satvik M., Arunkumar G., and T. C. Manjunath. “Development of Mathematical Model for Smart Intelligent Flexible Structures Using Smart Intelligent Sensor & Actuator Materials Using Timoshenko Beam Theory & Its Control Using POF.” *Materials Today: Proceedings*, International Conference on Newer Trends and Innovation in Mechanical Engineering: Materials Science, 37 (January 1, 2021): 648–55. <https://doi.org/10.1016/j.matpr.2020.05.630>.
- Lacka, Ewelina, T. C. Wong, and Mohamed Yacine Haddoud. “Can Digital Technologies Improve Students’ Efficiency? Exploring the Role of Virtual Learning Environment and Social Media Use in Higher Education.” *Computers & Education* 163 (April 1, 2021): 104099. <https://doi.org/10.1016/j.compedu.2020.104099>.
- Nufus, Hayatun, Ramon Muhandaz, Hasanuddin, Erdawati Nurdin, Rezi Ariawan, Rira Jun Fineldi, Isnaria Rizki Hayati, and Dominikus David Biondi Situmorang. “Analyzing the Students’ Mathematical Creative Thinking Ability in Terms of Self-Regulated Learning: How Do We Find What We Are Looking For?” *Heliyon* 10, no. 3 (February 15, 2024): e24871. <https://doi.org/10.1016/j.heliyon.2024.e24871>.
- Nugroho, Nur Alif, Widya Ayu Kartikasari Pratiwi, and Rizal Gunawan. “Peran Pemerintah Terhadap Eksistensi Wayang Timplong Sebagai Kebudayaan Lokal Khas Nganjuk.” *Kebijakan Dan Manajemen Publik* 5, no. 2 (2017): 13.
- Ojwala, Renis Auma, Susan Buckingham, Francis Neat, and Momoko Kitada. “Understanding Women’s Roles, Experiences and Barriers to Participation in Ocean Science Education in Kenya: Recommendations for Better Gender Equality Policy.” *Marine Policy* 161 (March 1, 2024): 106000. <https://doi.org/10.1016/j.marpol.2023.106000>.
- Parniawski, Peggy, Peggy Simonette, Cheryl Green, Evelyn Jacovino, Beth Boyd, Karen Antonino, and Amy Ashman. “The Succession Plan: Using Competency-Based Curriculums to Educate a New Generation of Nurse Leaders.” *Teaching and Learning in Nursing*, Special Issue on Evaluation, 19, no. 1 (January 1, 2024): 86–90. <https://doi.org/10.1016/j.teln.2023.09.019>.

- Presiden Republik Indonesia. Undang-Undang No. 20 Tahun 2003 Tentang Sistem Pendidikan Nasional (2003).
- Purmadi, Ary, and Kholisus Sa'di. "Pengembangan Kelas Virtual Berbasis Moodle Untuk Memfasilitasi Efektivitas Pembelajaran Siswa Di Sekolah Dasar." *Jurnal Inovasi Dan Teknologi Pembelajaran (JINOTEP): Kajian Dan Riset Dalam Teknologi Pembelajaran* 8, no. 1 (2021): 14.
- Putra, Siswadi Perdana, N Asi, Ernawati Anggraeni, and Karelius Karelius. "Development of Android-Based Chemistry Learning Media for Experimenting." *Journal of Physics: Conference Series* 1422 (2020): 12037. <https://doi.org/10.1088/1742-6596/1422/1/012037>.
- Putri, Linda Indiyarti. "Eksplorasi Etnomatematika Kesenian Rebana Sebagai Sumber Belajar Matematika Pada Jenjang MI." *Jurnal Ilmiah Pendidikan Dasar* 4, no. 1 (2017): 22–23.
- Putri, Linda Indiyarti, Nurwidiyanto Nurwidiyanto, and Alfiana Rohmah. "The Development Of Fraction Textbook With The Ethnomathematics Approach For Third Grade Student Of Madrasah Ibtidaiyah." *Al-Bidayah: Jurnal Pendidikan Dasar Islam* 12, no. 2 (April 2021): 165–82. <https://doi.org/10.14421/al-bidayah.v12i2.535>.
- Rahim, H, and N Che Dom. "Design and Development of Mobile Application Based on Proactive Elements of Safety Culture Framework for the Oil and Gas Industry: A Conceptual Framework." *IOP Conference Series: Earth and Environmental Science* 1151, no. 1 (March 2023): 012033. <https://doi.org/10.1088/1755-1315/1151/1/012033>.
- Ratnaningsih, Nani, Meti Nuradriani, and Icha Sofi Nurazizah. "Pengembangan Media Pembelajaran Pada Materi Transformasi Dengan Berbantuan I-Spring Dengan Pendekatan Etnomatematika Berbasis Android." *Jurnal Jendela Pendidikan* 1, no. 02 (2021): 36.
- Soleman, Nuraini. "Dinamika Perkembangan Kurikulum Di Indonesia." *Foramadiahi: Jurnal Kajian Pendidikan Dan Keislaman* 12, no. 1 (2020): 4.
- Suganda, V A, M Toybah, and S Hawa. *Buku Ajar Berbasis Hots: Pada Mata Kuliah Pembelajaran Matematika Di Kelas Rendah Sekolah Dasar*. Palembang: Bening Media Publishing, 2021.
- Sulistyowati, Endang, and Dona Ningrum Mawardi. "The Effectiveness Of Ethnomathematics Based Learning On Mathematics Ability Of Elementary School Students: A Meta-Analysis Study." *Al-Bidayah: Jurnal Pendidikan Dasar Islam* 15, no. 1 (2023): 4.
- Surahman, Ence, and Walid Fajar Antariksa. "Adaptive Mobile Learning Application As An Innovative Learning Media To Support The Quality Of Blended Learning Process." EAI, 2020. <https://doi.org/10.4108/eai.2-10-2018.2295454>.
- Vince, Marselina, and Ali Muhtadi. "Pengembangan Buku Digital Interaktif Matematika Pada Materi Geometri." *Jurnal Inovasi Teknologi Pendidikan* 6, no. 2 (2019): 202.

- Wiryanto, M. Gita Primaniarta, and José Roberto Linhares de Mattos. "Javanese Ethnomathematics: Exploration of the Tedhak Siten Tradition for Class Learning Practices." *Journal on Mathematics Education* 13, no. 4 (2022): 661–80. <https://doi.org/10.22342/jme.v13i4.pp661-680>.
- Wiryanto, Wiryanto, and Saraswati Indiyanti Kusuma Dewi. "Pengembangan Media Arlogy Berbasis Etnomatematika Untuk Pembelajaran Bangun Datar Dan Ruang Di Sekolah Dasar." *Jurnal Pendidikan Guru Sekolah Dasar* 10, no. 08 (2022): 1726.
- Zakiatun Nisa, Asfira, and Imam Rofiki. "Exploration of the Ethnomathematics of the Bung Karno Tomb Complex in Cultural Based Mathematics Learning." *Journal of Mathematics Education IKIP Veteran Semarang* 6, no. 1 (2022): 114.