# DEVELOPMENT OF APPLICATION MALABARU AS LEARNING MEDIA SPACE BUILDING MATERIAL IN GRADE V ELEMENTARY SCHOOL

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*Abstract*

*This study aims to identify the extent to which the results of the development of the MALABARU (Mari Belajar Bangun Ruang) application as a learning media for spatial geometry material in grade V of Elementary School. This application contains material on the types and properties of spatial geometry, spatial geometry nets, and how to calculate the surface area and volume of spatial geometry. This application is packaged in several features such as explanatory materials, learning videos, and educational games. The research method used in this study is Research and Development (RnD) using the ADDIE model which includes five stages, namely analysis, design, development, implementation, and evaluation. The subjects in this study were 39 grade V Elementary School students. The results of this study are that the learning media developed has been validated by three media experts with an average score of 95%, two material experts with an average score of 100%, and three language experts with an average score of 97.3% which indicates that the MALABARU application learning media is very suitable for use in the learning process. The results of the student questionnaire obtained an average score of 83.45% and the results of student activity observations obtained an average score of 87.07% which shows that the use of the MALABARU application has a positive impact on the learning process. Based on these results, the MALABARU application is considered very good and very suitable for use as a learning medium for spatial geometry material in grade V of Elementary School.*
*Keywords: MALABARU; Application; Space Building; Mathematics; Learning Media*

**Abstrak**

Penelitian ini bertujuan untuk mengidentifikasi sejauh mana hasil pengembangan aplikasi MALABARU (Mari Belajar Bangun Ruang) sebagai media pembelajaran materi bangun ruang di kelas V sekolah dasar. Aplikasi ini memuat materi tentang jenis dan sifat bangun ruang, jaring-jaring bangun ruang, serta cara menghitung luas permukaan dan volume bangun ruang. Aplikasi ini dikemas dalam beberapa fitur seperti materi penjelasan, video pembelajaran, dan game edukasi. Metode penelitian yang digunakan dalam penelitian ini adalah *Research and Development* (RnD) dengan menggunakan model ADDIE yang meliputi lima tahap yaitu *analysis*, *design*, *development*, *implementation*, dan *evaluation*. Subjek dalam penelitian ini adalah siswa kelas V Sekolah Dasar yang berjumlah 39 orang. Hasil penelitian ini adalah media pembelajaran yang dikembangkan telah tervalidasi oleh tiga orang ahli media dengan skor rata-rata 95%, dua orang ahli materi dengan skor rata-rata 100%, dan tiga orang ahli bahasa dengan skor rata-rata 97,3% yang menunjukkan bahwa media pembelajaran aplikasi MALABARU sangat layak digunakan dalam proses pembelajaran. Hasil angket siswa memperoleh skor rata-rata sebesar 83,45% dan hasil observasi aktivitas siswa memperoleh skor rata-rata sebesar 87,07% yang menunjukkan bahwa penggunaan aplikasi MALABARU memberikan dampak positif terhadap proses pembelajaran. Berdasarkan hasil tersebut, aplikasi MALABARU dinilai sangat baik dan sangat layak digunakan sebagai media pembelajaran materi bangun ruang di kelas V sekolah dasar.
**Kata Kunci:** MALABARU; Aplikasi; Bangun Ruang; Matematika; Media Pembelajaran

## Introduction

The rapid development of science and technology requires 21st century learning to utilize technology as part of the learning process. Learning in the 21st century has a very

important role in creating superior human resources, as well as preparing and supporting students to adapt to the demands of the development of science and technology (Sopian, et al., 2023). This condition requires humans to continue to adapt and follow these changes. Research by Rahayu, et al. (2022) states that the development of Science and Technology (IPTEK) in the 21st century has given birth to a new paradigm that emphasizes the importance of integrating technology in the learning process. In addition, Muhali (2019) stated that 21st century education requires mastery of critical thinking skills, creativity, and technology integration as the main components in creating an innovative learning process. From several opinions, it can be concluded that skills in using technology are one of the important aspects that students must have in 21st century education.

Behind the urgency of technology integration in 21st century learning, there are challenges that need to be faced, namely the lack of understanding of technology and adequate facilities for teachers to integrate technology in learning, which leads to a gap between theoretical demands and implementation in the field. Ismail, et al. (2021) stated that the limitations of technological media are an obstacle for teachers in integrating technology in learning. Factors that cause teachers' lack of ability to integrate technology in learning are a lack of understanding of IT and a lack of IT facilities provided by schools (Sahelatua, et al., 2018). Hulu (2023) stated that the lack of training and support is an obstacle for teachers in integrating technology in learning. Lack of training makes teachers less confident in integrating technology in learning. In addition, the incompatibility of learning media with the needs of a technology-based curriculum is one of the obstacles in the education process. Relevant and interactive media are very important in helping students understand complex concepts. Harahap (2019) stated that technology has penetrated various aspects of education, including learning media which are now starting to replace the role of books and traditional learning systems. Thus, the use of appropriate technology in learning media can increase the effectiveness of the teaching and learning process.

Learning media has an important role in supporting the success of learning objectives, especially in delivering material. Learning media is a tool to help the learning process in conveying messages clearly and learning objectives can be achieved effectively and efficiently (Nurrita, 2018). Nurhayati, et al. (2021) argue that the use of learning media that is able to present a clearer picture of a material can help students focus more on learning activities. Especially in mathematics learning, concrete visualization through interesting and interactive learning media plays an important role in strengthening students' understanding of the concepts being learned. Samudra & Budiono (2014) stated that due to the abstract nature of mathematics, aids such as media and props are needed to clarify the material presented by the teacher. In addition, Nasution, et al. (2023) stated that mathematics learning media is an important element in creating an effective learning process. Thus, it can be concluded that the use of media in mathematics learning has an important role in facilitating students' understanding of the concepts being taught.

However, in reality, there are still many mathematics learning activities that do not utilize relevant and interactive learning media. Research by Audhiha, et al. (2022) found that many teachers have not been able to develop learning media, so that learning about spatial geometry material is less effective and makes it difficult for students to understand it. Research by Syafril, et al. (2021) found that students' low understanding of spatial geometry material was caused by the lack of interest and awareness of teachers in preparing appropriate learning media. The lack of learning media that is specifically designed to address the abstract nature of geometric concepts is often the cause of the low achievement of basic competencies expected

by the curriculum (Nasution, et al., 2023). Research by Ismail, et al. (2020) stated that the lack of visualization skills is one of the main causes of students' difficulties in learning geometry. All of these findings confirm that the limitations of media and learning aids have a significant impact on students' understanding, especially in mathematics learning on spatial geometry material.

Based on the description above, one solution to overcome the limitations of media and mathematics learning aids while integrating technology in learning is to develop an interactive learning media application called MALABARU, which is specifically designed for fifth grade students in learning spatial geometry material. MALABARU is an acronym for "Mari Belajar Bangun Ruang" and is designed according to various types of children's learning. This application provides images of spatial geometry equipped with explanatory audio and learning videos to help students understand the concept more concretely. In addition, this application also offers interesting features, such as material explanations, learning videos, and educational games, so that it can increase student involvement in learning. This study aims to describe the process of developing the MALABARU (Mari Belajar Bangun Ruang) application as a learning media for spatial geometry material in fifth grade elementary schools and to evaluate its use in supporting the learning process in the classroom.

**Research Method**

This study uses the Research and Development (RnD) method. According to Sugiyono (in Sopian, 2023), Research and Development (RnD) is a type of research that aims to develop and test the effectiveness of a product. In this study, the product developed is the MALABARU (Mari Belajar Bangun Ruang) application which is designed as a learning medium for spatial building material in grade V of elementary school. The model used in this study is the ADDIE model which consists of five stages, namely Analysis, Design, Development, Implementation, and Evaluation (Hidayat & Nizar, 2021).
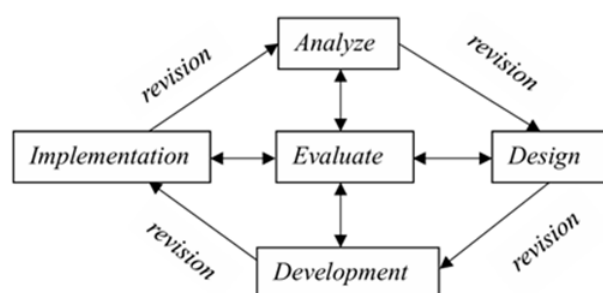


**Figure 1.** Research flow of the ADDIE model, source (Khariunnisa, et al., 2024)

At the analysis stage, several identifications were carried out, namely identifying the need to understand the problems in the field and finding the best solutions related to the research topic, as well as identifying the curriculum that includes Learning Achievements and Learning Objectives in the material of spatial figures in grade V of elementary school.

At the design stage, the design of the MALABARU application product was made with the help of Canva software which is expected to be a solution in overcoming problems in mathematics learning, especially in the material of spatial figures in grade V of elementary school.

At the development stage, the development of the product design that has been made into an application output was carried out using Smart Apps Creator software. After the

product design was completed into an application, a validation test process was carried out by media experts, material experts, and language experts on the application product that had been developed. After validation, revisions were made based on input and suggestions from experts in preparation for product trials in learning.

At the implementation stage, a field trial was carried out to apply the product that had been developed in learning. The MALABARU application is implemented in the learning process in elementary schools, from the beginning to the end of learning, to assess the quality and feasibility as a learning medium for spatial figures in grade V of elementary school. At this stage, the role of the teacher as an instructor is very necessary, the teacher must provide an understanding of the material related to spatial figures to students by explaining the material using the MALABARU application clearly and in language that is easy for students to understand. In addition, the role of the teacher as a guide is also needed, the teacher is tasked with directing students in using the MALABARU application so that the learning process runs smoothly, orderly, and in accordance with the expected goals.

At the evaluation stage, observations are made on aspects that need to be improved based on the results of product trials in learning. This evaluation aims to identify the shortcomings and advantages of the products that have been developed.

The subjects in this study involved 39 fifth-grade students of a public elementary school in Wado sub-district. The selection of fifth-grade students as research subjects was based on the relevance of the material in the learning media developed, namely the material on spatial shapes which is part of the mathematics curriculum at the elementary school level.

The instruments used in this study to determine the feasibility of the media developed were, 1) interview guideline instrument, 2) media expert validation instrument, 3) material expert validation instrument, 4) language expert validation instrument, 5) student questionnaire, and 6) student activity observation sheet.

The assessment of the expert validation instrument was carried out using a Likert scale with a score range of 1-4 which includes a score of 1 = no indicators appear, a score of 2 = only 1 indicator appears, a score of 3 = only 2 indicators appear, and a score of 4 = all indicators appear. After the data has been calculated, the results are interpreted based on the following feasibility interpretation criteria.

**Table 1.** Feasibility Interpretation Criteria

| Percentage (%) | Description |
|---|---|
| $80 \leq F \leq 100$ | Very valid, can be used without revision. |
| $60 \leq F < 80$ | Valid, can be used but needs minor revision. |
| $40 \leq F < 60$ | Quite valid, can be used but needs moderate revision. |
| $20 \leq F < 40$ | Less valid, recommended not to be used before major revision. |
| $F < 20$ | Very invalid, cannot be used. |

Assessment on the student questionnaire instrument was carried out using the opinion scale STS (Strongly Disagree), TS (Disagree), S (Agree), and SS (Strongly Agree). After the data has been calculated, the results are interpreted based on the assessment criteria for the student questionnaire results as follows.

**Table 2.** Student Questionnaire Assessment Criteria

| Percentage (%) | Criteria |
|---|---|
| QA < 20 | Very Poor (VP) |
| 20 ≤ QA < 40 | Poor (P) |
| 40 ≤ QA < 50 | Sufficient (S) |
| 50 ≤ QA < 80 | Good (G) |
| 80 ≤ QA ≤ 100 | Very Good (VB) |

Assessment of the student activity observation instrument was carried out using a Likert scale with a range of 1-4 which includes a score of 1 = 25% of students are active according to the observation indicator, a score of 2 = 50% of students are active according to the observation indicator, a score of 3 = 75% of students are active according to the observation indicator, and a score of 4 = 100% of students are active according to the observation indicator. After the data has been calculated, the results are interpreted based on the assessment criteria for the results of student activity observations as follows.

**Table 3.** Assessment Criteria for Student Activity Observation Results

| Percentage (%) | Criteria |
|---|---|
| AO < 20 | Very Poor (VP) |
| 20 ≤ AO < 40 | Poor (P) |
| 40 ≤ AO < 50 | Sufficient (S) |
| 50 ≤ AO < 80 | Good (G) |
| 80 ≤ AO ≤ 100 | Very Good (VB) |

**Results and Discussion**

The results of the development of the MALABARU application learning media are explained based on the ADDIE model which includes 5 stages. The initial stage of developing the MALABARU application learning media began with analyzing the needs that underlie the need for this development to be carried out (Sumandya & Widana, 2019). The needs analysis was obtained through an interview with one of the teachers of a public elementary school located in Wado sub-district, Sumedang district. Based on the interview results, the teacher had difficulty in delivering mathematics learning materials to students, especially spatial geometry material. The lack of school facilities and understanding of the use of technology were the reasons why teachers only relied on textbooks as learning resources. In learning the types of spatial geometry material, teachers had used concrete objects available at school such as mathematical teaching aids and objects in the school environment. However, with the limited number of media available, it was not possible for each student to access it independently, so the media could only be explained by the teacher to all students at the same time. This caused some students to feel bored and passive in the learning process. The delivery of learning materials that were only presented in textbooks and the use of uneven learning media were the causes of students' difficulties in understanding the mathematics material delivered by the teacher.

Based on the problems that occur in the mathematics learning process in one of the public elementary schools, the solution that can be attempted is to develop learning media, namely the development of the MALABARU application as a learning media for spatial geometry material in grade V of elementary school. This solution received a positive response from teachers. Teachers are happy if spatial geometry learning materials can be integrated into

application-based learning media because they can help teachers teach material to students in a concrete way. This can have a positive impact on students in utilizing smartphones as learning media (Sobon & Mangundap, 2019).

The development of this application is supported by several factors, one of which is the results of interviews which show that the availability of students' smartphones is quite adequate. Teachers stated that most students already have smartphones for learning, although some still have to borrow from their parents. In addition, school policies that allow the use of smartphones in learning also support the implementation of this application. This policy makes learning more interesting and allows students to understand the material more flexibly, including learning outside of class hours. Fransisca, et al. (2019) stated that in designing learning media, developers need to ensure that the media is easily accessible, can be used flexibly, and is in accordance with the applicable curriculum.

Furthermore, curriculum analysis is carried out to determine the learning outcomes related to spatial geometry material in grade V of elementary school which will be included as material content in the MALABARU application. Rahayuningsih, et al. (2022) argue that learning media must be in line with learning objectives and play a role in accelerating the learning process. The analysis of learning outcomes is carried out in the document of the Head of the Curriculum Standards and Education Assessment Agency No. 33/H/KR/2022 as a basis for determining the Learning Achievements that students will achieve after carrying out learning in class using the MALABARU application learning media.

**Table 4.** Learning Achievements for Phase C Spatial Geometry Material

| Elements | Learning Outcome |
|---|---|
| Geometry | Students can construct and analyze geometric shapes (cubes, blocks, and their combinations) and recognize spatial visualization (front, top, and side). They can compare characteristics between plane shapes and geometric shapes. They can determine locations on maps that use a grid system. |

Based on the results of the analysis, the development of the MALABARU application was carried out as a learning media for spatial geometry material in grade V of elementary school with the hope of being able to create interactive and enjoyable learning process activities for students so that students can easily understand the material being taught.

The second stage is the design stage, this stage aims to compile a product design according to the findings of the analysis and needs in application development (Melisa, et al., 2019). The design process in this stage is supported by Canva software. The MALABARU application presents material on spatial geometry, equipped with learning videos to clarify understanding of the material, and games as exercises for students to understand the material better. Isrokatun, et al. (2023) stated that students need learning media that is equipped with audio, images, and text that are easy to understand. Therefore, the design of the MALABARU application learning media design in this study was designed by paying attention to the visualization aspect to support the presentation of the material. The following is a display of the MALABARU application learning media design.
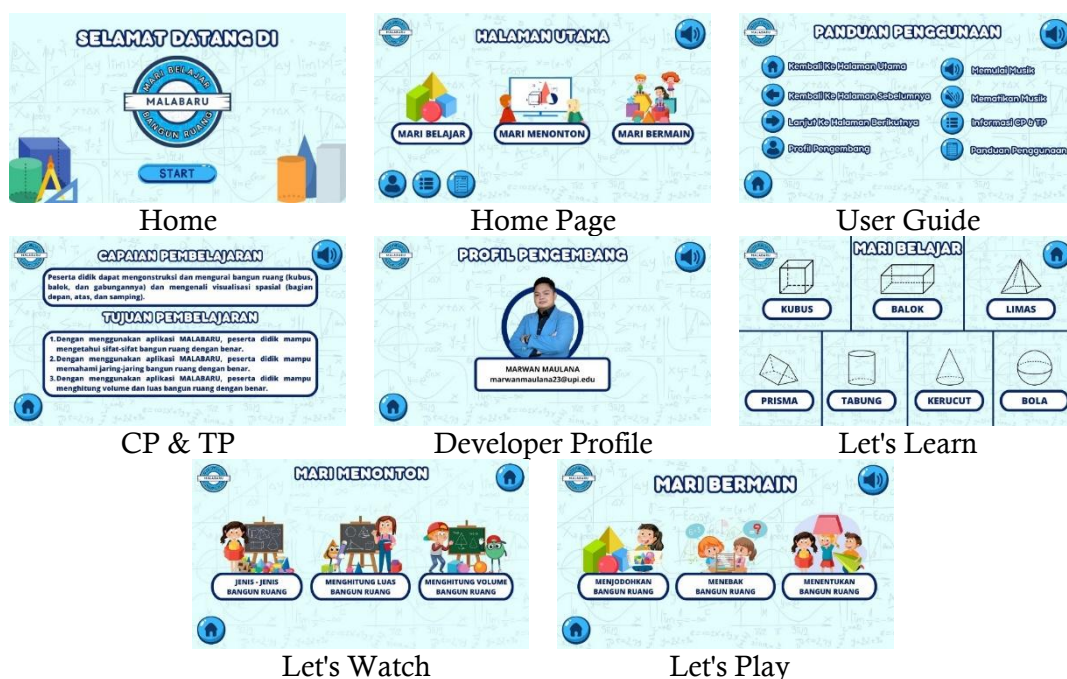
Home


Home Page


User Guide


CP & TP


Developer Profile


Let's Learn


Let's Watch


Let's Play

**Figure 2.** MALABARU Application Feature Design

After the design stage, the next step is the development stage. The development stage is the stage where media development is carried out according to the results of the analysis and design (Kurnia, et al., 2019). This study chose the development of the MALABARU application learning media based on Android because of its ease of use and compatibility with various smartphone brands. Djonaka & Permana (2021) stated that Android applications have advantages in ease of use and can be used on various smartphone brands. The development process begins by downloading the design from Canva, preparing the learning video link, and preparing the sound to be used. After all the materials are collected, these elements are entered into the Smart Apps Creator (SAC) software. SAC was chosen because it makes it easy to create learning media applications. Hamidah & Nisa (2022) stated that Smart Apps Creator can be used as an application to create mobile apps on Android and iOS easily without programming code. The prepared design is then moved into SAC and converted into an .apk file, as explained in the following image.
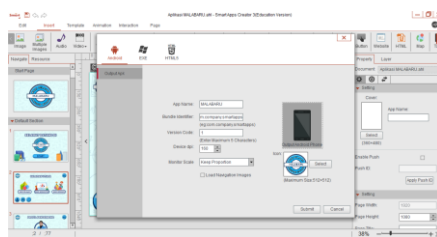

The process of inserting images into SAC


The process of inserting sound into SAC


Tools available in SAC

Export stage to APK file
**Figure 3.** Development of the MALABARU Application

After the application is developed, the next stage is validation involving three media experts, two material experts, and three language experts. The results of the expert validation questionnaire recapitulation are presented as follows.

**Table 5.** Recapitulation of Expert Validation Results

| Validator | Percentage (%) | Average |
|---|---|---|
| Media Expert I | 87,5 | |
| Media Expert II | 97,5 | 95 |
| Media Expert III | 100 | |
| Material Expert I | 100 | 100 |
| Material Expert II | 100 | |
| Linguist I | 96 | |
| Linguist II | 100 | 97 |
| Linguist III | 96 | |

The average validation results from material experts, language experts, and media experts on the MALABARU application learning media with a media feasibility percentage reaching 95%, material feasibility 100%, and language feasibility 97% indicate that the MALABARU application learning media is very suitable for use in the learning process.

Next is the implementation stage, namely the trial stage of the media that has been developed (Cahyadi, 2019). In the implementation process, the media was tested on 39 grade V elementary school students. During the trial process, students were given a student questionnaire to see the feasibility of the MALABARU application learning media used in learning. The results of the student questionnaire recapitulation can be seen in the following table.

**Table 6.** Recapitulation of Student Questionnaire Sheets

| Aspects | Percentage (%) | Description |
|---|---|---|
| Ease of Use of Application | 80,6 | Good |
| Interest and Motivation | 84,6 | Very good |
| Design and Visual Appearance | 86,3 | Very good |
| Material Understanding and Accessibility | 82,3 | Very good |

Table 6 shows very positive results for the MALABARU learning media. The percentage of the ease of use aspect of the application shows that the application is quite easy to use although there is still room for improvement. The good results of the student questionnaire in this ease aspect indicate that the development of the application is in

accordance with the principle of using learning media, namely to facilitate the student learning process (Sapriyah, 2019).

The percentage of the interest and motivation aspects shows that the application is able to attract the attention of users while providing high motivation during its use. Nurfadhillah, et al. (2021) stated that the use of learning media can foster students' interest in the new material presented, so that the material becomes easier to understand. The percentage of the design and visual appearance aspects confirms that the visual design and aesthetics of the application are very satisfying for users.

Meanwhile, the percentage of the understanding of the material and accessibility aspects indicates that the material in the application is easy to understand and its accessibility greatly supports user needs. Wulandari, et al. (2023) argue that the use of learning media in the classroom not only makes it easier for teachers to explain the material, but also makes it easier for students to learn lessons in more depth. Overall, the results indicate that the MALABARU application is very suitable for use in learning spatial geometry material in grade V of elementary school.

**Table 7.** Recapitulation of Observation Results

| Aspect | Percentage | Description |
|---|---|---|
| Oral Activities | 87,5% | Very good |
| Motor Activities | 83,3% | Very good |
| Mental Activities | 87,5% | Very good |
| Emotional Activities | 100% | Very good |

The results of observations of student activities during the trial of using the MALABARU application showed a very positive response from various aspects of the observed activities. The percentage in Oral Activities shows that students can actively participate and use polite language during the trial. The percentage in Motor Activities shows that students are able to understand how to use the application, operate and use the MALABARU application, although slightly lower than other aspects. Furthermore, the percentage in Mental Activities shows that students are able to complete the games in the application and answer questions given by the teacher regarding the material on spatial shapes. Meanwhile, the percentage in Emotional Activities shows that the application has succeeded in providing a very positive emotional impact on users, where students show an optimistic and enthusiastic attitude in completing each game in the MALABARU application. These results prove that the MALABARU application is able to provide a very satisfying experience in supporting various types of user activities. This finding is in line with research Yatini (2022), which states that the use of information and communication technology in the world of education has a very high level of effectiveness in supporting the learning process.

The final stage in this study is evaluation. After implementing the MALABARU application learning media to students, several challenges and limitations were found that needed to be considered as evaluation materials. These notes were obtained through student questionnaires and observations of student activities.

First, during the product trial, obstacles arose in the form of noise caused by the volume of sound on each smartphone colliding with each other when the application was used simultaneously. To overcome this, an active role of teachers is needed in regulating the use of the application, especially by ensuring that the volume of each student's device is not too high and is only enough to be heard personally. Nalapraya (2023) stated that teachers have

responsibilities in aspects of classroom management, such as organizing a school environment that is focused, challenging, and stimulates students to learn with a sense of security and satisfaction in order to achieve educational goals.

Second, based on the results of the student questionnaire, there were suggestions to add game elements to the MALABARU learning media to make it more interesting and interactive. This input can be considered for future application development to increase student engagement and motivation to learn, so that it can be more effective in supporting teaching and learning activities.

Third, the duration of use is limited and not sustainable. In the Independent Curriculum, learning of spatial figures in grade V ideally takes place in seven meetings, each discussing one spatial figure. However, in this study, the application usage time did not fully reflect the ideal duration, so that students' understanding of the concept was less than optimal. Therefore, teachers need to act as administrators. Nalapraya (2023) stated that teachers have responsibilities in administrative aspects, such as preparing learning plans and documenting student learning outcomes regularly.

Fourth, student motivation and interest in using the MALABARU application. During the implementation, it was shown that most students were more interested in the game menu in the MALABARU application than the learning features, so students tended to only read the material briefly and listen to audio without deep focus. Therefore, the role of teachers as motivators is very much needed. Nalapraya (2023) emphasized that teachers must be able to raise enthusiasm and encourage students' activeness in the learning process.

## Conclusion

The development of MALABARU learning media using the Research and Development (R&D) method with the ADDIE model has produced a product that has been validated by eight experts, who stated that this application is very suitable for use in supporting the learning process. The results of the student questionnaire showed that MALABARU is effective as an interactive learning media, able to facilitate understanding of concepts, increase students' interest and motivation to learn, and contribute positively to the quality of learning and student engagement. For further development, it is recommended to test the application in various schools with different conditions in order to obtain more comprehensive data, as well as the addition of interactive features such as 3D simulations or augmented reality (AR) to enrich the learning experience. In addition, improving the quality of audio and navigation is recommended to optimize the use of the application in classroom learning. The findings of this study are expected to be a reference for teachers in teaching Spatial Building material in Mathematics subjects in grade V of elementary schools and become the basis for further research in developing more comprehensive innovations to improve the MALABARU application in the future.

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