JIPI (Jurnal Ilmiah Penelitian dan Pembelajaran Informatika)
Journal homepage: https://jurnal.stkippgritulungagung.ac.id/index.php/jipi
ISSN: 2540-8984
Vol. 10, No. 1, Maret 2025, Pp. 482-493

DEVELOPMENT OF A MATHEMATICS-BASED MODULE *AUGMENTED REALITY* (AR) ON SPACE BUILDING MATERIAL IN CLASS V PRIMARY SCHOOL

Salsabilla Briliana Elkafiyani[1)], Fitri Alyani*[2)]

1. Primary Teacher Education, Faculty of Teacher Training and Education, Muhammadiyah University Prof. DR. HAMKA, Indonesia
2. Mathematics Education, Faculty of Teacher Training and Education, Muhammadiyah University Prof. DR. HAMKA, Indonesia

Article Info

Keywords: *Augmented Reality*; *Geometry; Instructional Media; Technology*

Article history:
Received 24 October 2024
Revised 22 November 2024
Accepted 3 December 2024
Available online 1 March 2025

DOI :
https://doi.org/10.29100/jipi.v10i1.5983

* Corresponding author.
Corresponding Author
E-mail address:
fitrialyani@uhamka.ac.id

ABSTRACT

This research aims to develop a mathematics module on geometric material that is suitable for use as a teaching medium for mathematics subjects in class V of elementary schools and is useful as an additional reference for teachers in teaching and learning activities. The research method used is the research and development method (*Research and Development*). Researchers use the RnD (Research and Development) research method using the ADDIE development model in their activities and use questionnaires to collect data related to practicality and tests to measure learning outcomes after reading the module. The data analysis carried out in this research was a data analysis technique using a descriptive scale. The research results show that the mathematics module is based on space *augmented reality* developed is feasible and practical for use in mathematics learning. The results of the validation carried out by material experts, in this study, got a score interval of "very valid", then the results of the validation carried out by media experts in this study got a score interval of "very valid" and the results of the validation carried out by education experts in this study got “very valid” score interval.

.

I. INTRODUCTION

From in today's digital era, the use of learning media plays an increasingly important role in supporting the teaching and learning process in schools. Learning media, such as interactive multimedia, learning videos, and educational software, can provide a more interesting and enjoyable learning experience for students. The purpose of using learning media is to facilitate communication and improve learning outcomes. With the development of technology in the field of education, many media are used as learning tools, one of which is *Augmented Reality*. *Augmented Reality* is a technology that is capable of combining computer-generated objects, both two-dimensional and three-dimensional, using a camera in real time to display visualization models in the real world [1][2].

Technology *Augmented Reality* It is already available on iOS and Android, two systems that are very popular among the public. Almost all students and teachers already have devices with this system, so there will be no significant obstacles in using it for learning. In the context of mathematics learning, *Augmented Reality* can be used to visualize geometric concepts in a more interesting and concrete way. It allows students to view, interact, and experiment with geometric objects in a virtual environment that combines the real world with mathematical elements. Students can use their mobile devices or tablets to access the app *Augmented Reality* specifically designed for their learning [3][4][5].

With this technology, someone can get the sensation of exploring and learning in a fun and unique way because they can be directly involved in the learning. AR has great opportunities in the world of education and health. Materials in the educational sector can be simulated and applied by creating 3D objects and animations, so that students can directly interact with the objects contained in the AR application. In the health sector, AR technology can be used directly for users as learning, so that users can study body organs and other things according to the simulated objects. Technology in the field of education is developing so rapidly in the learning process, initially the learning process was carried out only by using books provided by the teacher or school, so that students could only understand the subjects taught by simply reading books. The pictures in the book do not make students

immediately understand the lessons taught by the teacher. For example, biology subjects study a lot about the human body and students need to know a lot about human organs such as the human excretory system. By using AR (Augmented Reality) to help the biology learning process, especially about the Human Excretory System [6], [7].

According to researchers, the introduction of Technology *Augmented Reality* to students provides new experiences for teachers and students in the teaching and learning process. Teachers and students understand the use of technology *Augmented Reality* (AR), so that students do not feel bored in the learning process with AR applications. This makes it easier for students to understand mathematics lesson material about geometric shapes and flat shapes. By presenting mathematics material in a more interesting and interactive form, students become more interested in learning. When students feel interested, they tend to be more involved in the learning process, which can ultimately improve their understanding of difficult mathematical concepts [4][8].

Augmented Reality is a technology that combines the real and virtual worlds by displaying three-dimensional (3D) objects in the real world through a camera, so that the objects appear as if they are in the real world. AR also makes it possible to display illustrations that are difficult to realize concretely. *Augmented Reality*, or augmented reality, integrates three-dimensional (3D) virtual objects into a three-dimensional real environment and displays them in real-time. In contrast to virtual reality which completely replaces reality, augmented reality only adds or complements reality [9][10].

Mathematics includes important material that must be studied, one of which is spatial geometry or geometric shapes, which needs to be taught from an early age. According to the researchers, studying geometric shapes is very important because it has several benefits, including teaching students to be more careful and precise, providing broad knowledge and insight that can be implemented in everyday life, and supporting understanding of other material. Space geometry in mathematics includes material that has abstract concepts, so students not only have to understand the definition, but also be able to explain the abstract concept [11][12][13]. Geometry is a field that is closely related to design, because in general, geometry includes lines and angles, flat figures, spatial figures, symmetry, similarity, congruence, and analytical geometry. Space geometric material is one part of the geometry taught at elementary school level, which includes concepts such as cubes, blocks, prisms and pyramids. This material requires visualization in the learning process so that the concepts of angles, corner points, plane diagonals and space diagonals can be understood more easily by students [14][15].

Understanding the concepts and measurements of geometric figures is one of the important competencies in mathematics subjects in elementary schools. Mathematics has an important value in everyday life and is considered one of the last basic subjects in elementary school. The main principle in learning mathematics is to practice solving problems. Through this exercise, students can develop skills in solving everyday problems by applying mathematical concepts [16]. Learning media using *Augmented Reality* has advantages in improving the learning process and students' interest in learning because *Augmented Reality* can project in a real way and involve the interaction of all five senses of students as stated by Koehnert's theory that "the more senses involved in the learning process, the more effective the learning process will be" [17][18].

With advances in technology, teaching modules have been developed based on *Augmented Reality* very suitable to the needs of students in the current era. According to Fernande Gracia, *Augmented Reality* is a concept that integrates digital information such as images, video, audio, or text into a virtual environment and displays it in a real way [16]. Potency *Augmented Reality* in the development of teaching materials in the future is very important because it makes learning more interesting and opens up new opportunities to improve the quality of learning. In accordance with the results of previous research, development of learning media *Augmented Reality* shows very positive results and is suitable for use as a learning tool in the classroom. Superiority *Augmented Reality* includes more interactivity in the learning process, effectiveness of use, relatively low manufacturing costs, and ease of operation [19][20][21][17].

Augmented Reality as a learning medium is made to be as interesting as possible and communicative to students, inviting students to carry out multisensory activities (activities carried out involving more than one sense). Applying AR technology innovations in learning will create an effective learning atmosphere and provide an overview of the real world environment in a computer-based learning system. Ardi is applied in the world of education because of the advantages it has by combining real world situations [22][17].

In previous research, researchers used a computer program that can be used as a mathematics learning medium, namely the GeoGebra program. GeoGebra is a dynamic geometry system software that can construct points, vectors, segments, lines, conic sections, even functions and change them dynamically. GeoGebra can be used as a

mathematics learning medium to demonstrate or visualize mathematical concepts and as a tool to construct mathematical concepts [23] [24].

Besides that, *Augmented Reality* helps students to describe mathematical concepts more realistically. For example, students can use applications *Augmented Reality* to observe spatial shapes in three dimensions or see changes in the graph of a mathematical function. This allows students to directly see and feel math concepts, which can help them understand and remember the material more effectively. Use *Augmented Reality* can also support independent learning, because students can use devices *Augmented Reality* in their homes for deeper exploration of mathematics. They can run simulations, answer questions, and solve math problems with the help of module-based *Augmented Reality*. This gives them control over the learning process and supports the development of valuable independent skills [2]. Therefore, this research intends to develop a Mathematics-Based Module *Augmented Reality* (AR) on Building Space Material in Class V Elementary School.

II. RESEARCH METHOD

A. Research Model

This research uses research and development (R&D) methods with the ADDIE development model (*Analyze, Design, Development, Implementation, Evaluation*). The selection of this model was based on the consideration that this model was developed in a structured manner with a strong theoretical foundation in learning design. The ADDIE model consists of five steps or stages that are easy to understand and apply to develop various educational products such as textbooks, learning modules, learning videos, multimedia, and others. In addition, this model allows evaluation at each stage of development, providing opportunities for continuous improvement and improvement.

B. Research Procedure

Research stages using the ADDIE model (*Analyze, Design, Development, Implementation, Evaluation*) as shown in Figure 1. The five development stages referred to are as follows:

1. Analysis
   Analysis involves efforts to evaluate needs, identify problems or needs, and carry out task analysis. An explanation of these three stages is as follows:
   a. Needs analysis was carried out by conducting a survey to evaluate the needs of fifth grade students in elementary schools.
   b. Identification of problem needs is carried out by referring to survey results, analyzing the challenges that exist in building material in mathematics lessons, and considering the needs desired by students during the learning process.
   c. Task analysis is carried out through discussions with the class V homeroom teacher regarding the material to be developed.
2. Design
   At this stage, the research objective is formulated, namely to develop a learning module on the material. At this stage, the research aims to develop a learning module on spatial building material. After that, the researcher needs to prepare a test or tests which must be based on the research objectives that have been previously determined. Researchers also prepare an assessment questionnaire, which is first validated by the supervisor to ensure that the questionnaire is able to measure the aspects that need to be assessed in the module being developed. Apart from that, module design is carried out through discussions between researchers and supervisors
3. Development
   Development is the process of turning initial designs into reality. The stages carried out by researchers in development include compiling learning modules, validating them by experts, and carrying out revisions, as explained below:
   a. Compilation of Modules
      At this stage, researchers create learning modules based on previously designed material. This preparation process produces learning modules that will be evaluated by material experts and media experts to ensure their quality.
   b. Validation by Experts
      At this stage, researchers present the learning module to material experts and media experts to obtain validation. The purpose of this stage is to ensure that the module meets the initial

development objectives, covers all the material that must be taught, and meets the standards that have been set. Validation is carried out using an assessment sheet that has been prepared and verified previously. The media expert and material expert validation scale instruments are used to measure the feasibility of augmented reality-based spatial mathematical module products. This validation scale refers to the learning module evaluation instrument for media experts and material experts [25].

c. Media Development
At this stage, the learning media being developed is built using Canva software (*software*) which is used as a module editing application, *AssemblrEdu* (*software*) which is used as an application to create images *Augmented Reality* (AR), Blender 4.1 (*software*) which is used to create 3-dimensional image designs, and Laptops (*hardware*) with *processor* AMD A4-9125 RADEON R3, 4 COMPUTE CORES 2C+2G.

4. Implementation
In the implementation stage, researchers carried out two stages, namely validity testing on lecturers and educational experts and practicality testing on 42 students.

5. Evaluation
Evaluation is a step to assess the success and suitability of a model that is being developed or has been completed. If there are important suggestions or recommendations obtained from product trials at the implementation stage, the product will be revised. Evaluation involves a revision process based on input provided by material experts and media experts.

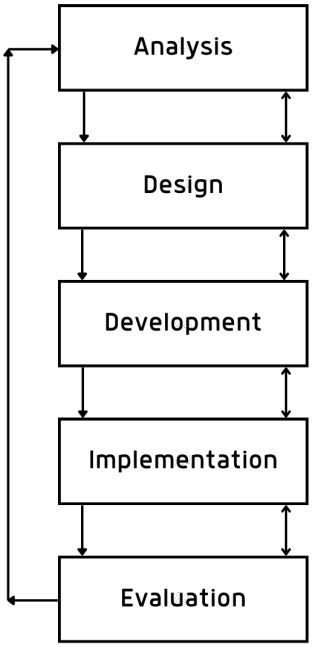


Figure 1. Product Development Procedure

C. Data Collection Techniques

The methods used for data collection included direct observation and distributing questionnaires to fifth grade elementary school students. In this research, data analysis was carried out using questionnaire and observation techniques, as well as analyzing data obtained from validation test results by material expert lecturers and media experts, as well as students' practical tests on the products being developed.

D. Data Analysis Technique

The data analysis technique was carried out using measurements with a descriptive scale. Descriptive statistics are statistics that are used to analyze data by describing or illustrating the data that has been collected as it is without the intention of making general conclusions or generalizations. The data analysis technique is by giving a score to the answers to the data taken from the questionnaire, which is data obtained from measurements using a Likert scale arranged in positive categories, meaning that positive statements get the highest score, with the following scores :

JIPI (Jurnal Ilmiah Penelitian dan Pembelajaran Informatika)
Journal homepage: https://jurnal.stkippgritulungagung.ac.id/index.php/jipi
ISSN: 2540-8984
Vol. 10, No. 1, Maret 2025, Pp. 482-493

TABEL I.
LIKERT SCALE

Aspect	Indicator
Very good/strongly agree	: score 5
OK/agree	: score 4
Good enough/quite agree	: score 3
Not good/disagree	: score 2
Very unfavorable/strongly disagree	: score 1

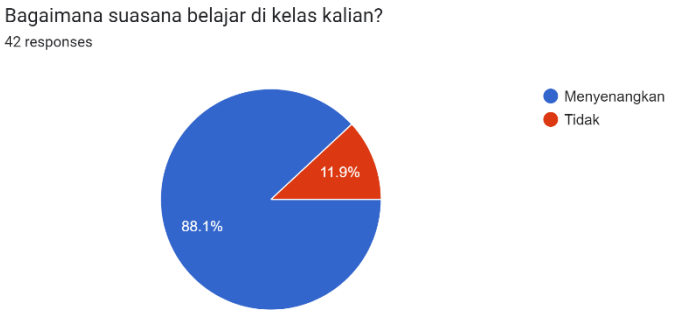
Source : Riduwan dan Sunarto (2011:23)

III. RESULT AND DISCUSSION

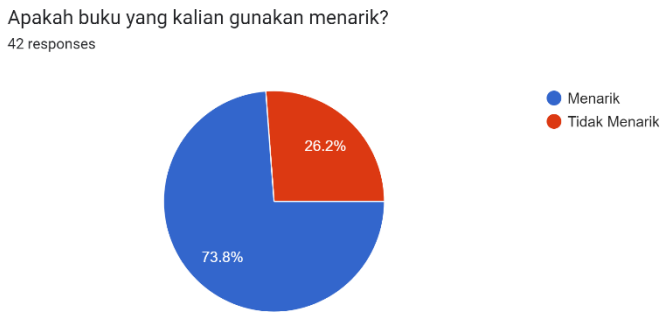
A. Results of Student Needs Analysis

The questionnaire was given to 42 fifth grade elementary school students. This questionnaire consisted of 10 questions which were used to determine students' needs for the learning module being developed. The results of the student needs questionnaire are in the following table:

TABLE II.
RESULTS OF STUDENT NEEDS ANALYSIS

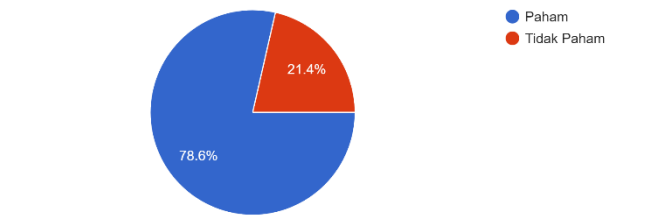
No	Questionnaire Results	Information
1.		As many as 83.3% of students always prepare before learning takes place.
2.		As many as 88.1% of students felt that the atmosphere in the classroom when learning was enjoyable.
3.		As many as 38.1% of students use text-books when classroom learning is in progress.

4.



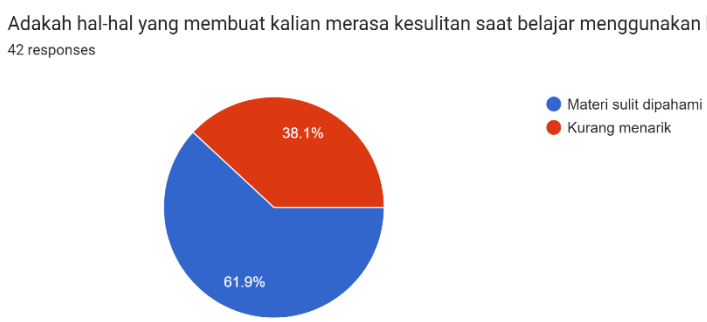
As many as 73.8% of students considered the textbooks they used when learning in class to be interesting.

5.



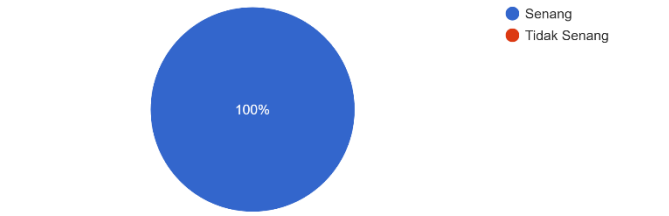
As many as 78.6% of students understand when studying in class using textbooks.

6.



As many as 61.9% of students felt that there were things that made them find it difficult to learn, namely when the book had material that was difficult to understand.

7.



As many as 100% of students feel happy if they learn using books with pictures that can be seen directly.

8.		As many as 100% of students felt that studying using books with pictures that could be seen directly would make their learning easier.
9.		As many as 100% of students feel happy if they learn using colorful and interesting books.
10.		As many as 100% of students felt that studying using colorful and interesting books would make their learning easier

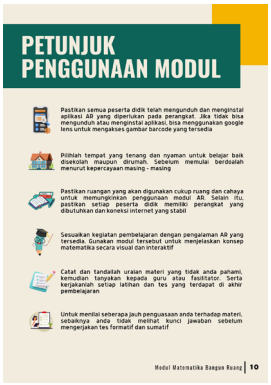
After analyzing the students' needs, the researcher discussed with the supervisor to discuss the material to be developed. After this stage was completed, the researcher continued by discussing with the class teacher to ensure the suitability of the material to be developed. After determining the needs of students, researchers studied relevant spatial building materials, especially for class V elementary schools.

B. Product Planning

At this stage, the researcher creates a storyboard as a guide for module development, then designs the software needed in the development process. The following is a storyboard for a mathematics-based teaching module *Augmented Reality* on building materials for class V elementary school:

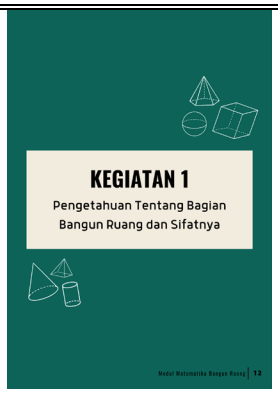
JIPI (Jurnal Ilmiah Penelitian dan Pembelajaran Informatika)
Journal homepage: https://jurnal.stkippgritulungagung.ac.id/index.php/jipi
ISSN: 2540-8984
Vol. 10, No. 1, Maret 2025, Pp. 482-493

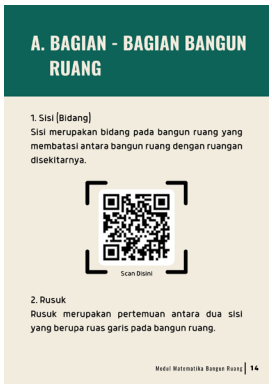
TABLE III.
PRODUCT PLANNING STORYBOARD

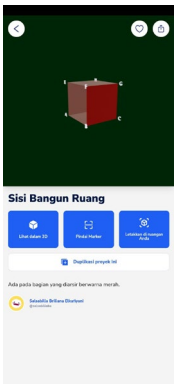
No.	Description	Picture
1.	The main page contains the module cover which is equipped with illustrations or images that are relevant to the module content.	
2.	The instructional goal is to provide direction and focus to the learning process, ensuring that each activity and material presented is in accordance with the expected competencies.	
3.	A competency map is a clear and structured guide regarding the competencies that students must achieve while studying the material.	
4.	Instructions for using the module are very important to ensure that users, whether students or teachers, can make optimal use of the module.	

JIPI (Jurnal Ilmiah Penelitian dan Pembelajaran Informatika)
Journal homepage: https://jurnal.stkippgritulungagung.ac.id/index.php/jipi
ISSN: 2540-8984
Vol. 10, No. 1, Maret 2025, Pp. 482-493

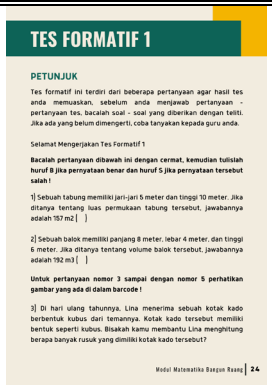
5. Activity 1 consists of understanding the parts of space and their properties. On the next page, there are several barcode codes and descriptions containing images in the form *Augmented Reality.*







6. Concept test (Contains evaluation questions for each activity)


TES FORMATIF 1

PETUNJUK

Tes formatif ini terdiri dari beberapa pertanyaan agar hasil tes anda memuaskan, sebelum anda menjawab pertanyaan - pertanyaan tes, bacalah soal - soal yang diberikan dengan teliti. Jika ada yang belum dimengerti, coba tanyakan kepada guru anda.

Selamat Mengerjakan Tes Formatif 1

Bacalah pertanyaan dibawah ini dengan cermat, kemudian tulislah huruf B jika pernyataan benar dan huruf S jika pernyataan tersebut salah !

1] Sebuah tabung memiliki jari-jari 5 meter dan tinggi 10 meter. Jika ditanya tentang luas permukaan tabung tersebut, jawabannya adalah 157 m2 [ ]

2] Sebuah balok memiliki panjang 8 meter, lebar 4 meter, dan tinggi 6 meter. Jika ditanya tentang volume balok tersebut, jawabannya adalah 192 m3 [ ]

Untuk pertanyaan nomor 3 sampai dengan nomor 5 perhatikan gambar yang ada di dalam barcode !

3] Di hari ulang tahunnya, Lina menerima sebuah kotak kado berbentuk kubus dari temannya. Kotak kado tersebut memiliki bentuk seperti kubus. Bisakah kamu membantu Lina menghitung berapa banyak rusuk yang dimiliki kotak kado tersebut?

Modul Matematika Bangun Ruang | 24

C. *Test Results from Material Experts and Media Experts*

The results of material expert testing are carried out by Mathematics Education lecturers, while media experts are carried out by Physics Education lecturers and PPG staff who are experts in the field of media. The results of the material expert's testing can be seen in the results below:

TABLE IV.
MATERIAL EXPERT TEST RESULTS

No.	Aspects	Indicators	Scores
1.	Introduction	1	5
		2	5
		3	5
		4	4
		5	5
2.	Leaning	6	5
		7	5
		8	5
		9	5
		10	5
		11	5
		12	5
3.	Head	13	5
		14	5
		15	5
		16	5
		17	4
		18	5
		19	5
		20	5
4.	Assignments/Evaluations/Assess-ments	21	4
		22	4
		23	5
		24	4
		25	5
		26	5
		27	5
5.	Summary	28	5
		29	5
	Total Score		**135**

Source: Sungkono (2012: 10-11)

From the test results, the following percentages can be obtained:

$$\text{Eligibility Percentage (\%)} = \frac{Total\ Skor}{Skor\ Tertinggi}\ x\ 100\%$$

$$= \frac{135}{140}\ x\ 100\% = 96\%$$

Judging from these calculations, it can be concluded based on the table above, that the material in learning media is stated "**very valid**". The next step is to carry out media expert testing which is presented in the following table:

TABLE V.
MEDIA EXPERT TEST RESULTS

No.	Aspects	Indicators	Scores
1.	Physique	1	5
		2	5
		3	4
		4	5
		5	5
		6	5
		7	5
		8	5
		9	5
		10	4
		11	5
		12	5
		13	5
2.	Quality	14	4
		15	4
		16	4
		17	5
		18	5
3.	Functionality and Consistency	19	5
		20	5
		21	4
Total Score			**99**

Source: Sungkono (2012: 11-13)

From the test results, the following percentages can be obtained:

$$\text{Eligibility Percentage (\%)} = \frac{Total\ Skor}{Skor\ Tertinggi}\ x\ 100\%$$

$$= \frac{99}{105}\ x\ 100\% = 94\%$$

Based on the test results carried out by experts, all the features in this application can function 94% and based on the table above it is stated "**very valid**" used for learning media.

D. Product Trial

The field test was carried out involving 42 fifth grade elementary school students as respondents. Researchers distributed a questionnaire consisting of 13 questions which included student responses to the material, content and appearance of the module. Each answer A is given a weight of 1, while answer B is given a weight of 0. The weights of each aspect are added up to calculate the total score, which is then converted into a score percentage. A practicality test was carried out to evaluate the practicality of learning media, and the results of this analysis were reported to 42 students. Researchers noted that the score collected was 541. From the results of this test, the percentage can be calculated as follows:

$$\text{Eligibility Percentage (\%)} = \frac{Total\ Skor}{Skor\ Tertinggi}\ x\ 100\%$$

$$= \frac{541}{546}\ x\ 100\% = 99\%$$

The results of the calculations show that the feasibility score for the augmented reality-based spatial mathematics module developed by the researchers received a score of 99% which is included in the category "**very practical**" to be used in the learning process. Observations made show that the developed augmented reality-based spatial mathematics module can support the teaching and learning process because with this module children will get a learning model that is creative, innovative and can encourage students' interest in learning.

Previous research examined learning media using the GeoGebra application. The difference in previous research centered on the use of GeoGebra as a visualization tool to improve learning outcomes, the latest research shifts attention to the use of Augmented Reality (AR) technology which allows students to interact with spatial models in three dimensions. The use of AR allows students to interact directly with three-dimensional models, providing

a deeper and more concrete understanding of mathematical concepts, and facilitating more effective independent learning [24].

IV. CONCLUSSION

Based on the results of the discussion, this research produces a product in the form of a space-based mathematics learning module *Augmented Reality* (AR) for fifth grade elementary school students. Researchers have developed a product that is considered valid and practical for use as a learning medium for spatial construction for elementary school students, especially class V. The existence of this module makes it easier for students to learn spatial construction material.

REFERENCE

[1] A. D. Putra, M. R. D. Susanto, and Y. Fernando, "Penerapan MDLC Pada Pembelajaran Aksara Lampung Menggunakan Teknologi Augmented Reality," *Chain J. Comput. Technol.*, vol. 1, no. 2, pp. 32–43, 2023.
[2] D. S. Laksono, "Penerapan Teknologi Augmented Reality Pada Android Sebagai Media Pembelajaran Huruf Aksara Jawa Bagi Anak Didik Setingkat Sltp," *Ubiquitous Comput*, vol. 1, pp. 67–80, 2018.
[3] U. Khadijah, "Pemanfaatan Augmented Reality untuk Meningkatkan Keterampilan Geometri dalam Pembelajaran Matematika," *J. Dunia Ilmu*, vol. 3, no. 3, pp. 1–13, 2023.
[4] R. R. F. Sinaga, "The Implementation of Fun Fishing to Teach Speaking for Elementary School Students," *J. English Lang. Teach. Learn*, vol. 1 (1), pp. 1–6, 2020.
[5] A. Ismayani, *Membuat Sendiri Aplikasi Augmented Reality*. Jakarta: PT. Elex Media Komputindo, 2020.
[6] N. Navab, T. Blum, L. Wang, A. Okur, and T. Wendler, "First Deployments of Augmented Reality in Operating Rooms," *Computer (Long. Beach. Calif).*, vol. 45, no. 7, pp. 48–55, Jul. 2012, doi: 10.1109/MC.2012.75.
[7] R. Y. Endra and D. S. Aprilita, "E-Report Berbasis Web Menggunakan Metode Model View Controller Untuk Mengetahui Peningkatan Perkembangan Prestasi Anak Didik," *J. Explor*, vol. 9, no. 1, pp. 15–22, 2018.
[8] S. Pratama and E. Al, "Pengenalan Teknologi Augmented Reality Pada Pembelajaran Matematika Bangun Ruang Dan Bangun Datar," *Community Dev. J.*, vol. 4, no. 1, pp. 217–221, 2023, [Online]. Available: https://doi.org/10.31004/cdj.v4i2.12137
[9] F. Rozi, R. R. Kurniawan, and F. Sukmana, "Pengembangan Media Pembelajaran Pengenalan Bangun Ruang Berbasis Augmented Reality Pada Mata Pelajaran Matematika," *JIPI (Jurnal Ilm. Penelit. Dan Pembelajaran Inform.*, vol. 6 (2), pp. 436–447, 2021.
[10] A. M. Arifin, H. Pujiastuti, and R. Sudiana, "Pengembangan media pembelajaran STEM dengan augmented reality untuk meningkatkan kemampuan spasial matematis siswa," *J. Ris. Pendidik. Mat. Jakarta*, vol. 7 (1), pp. 59–73, 2020.
[11] I. S. Wardhani, "Geometri dan Permaslaahannya dalam Pembelajaran Matematika di Sekolah (Suatu Penelutuan Meta Analisis)," *Pros. Semin. Nas. Integr. Mat. Dan Nilai Ilm.*, vol. 3 (1), pp. 124–129, 2020.
[12] M. Chintia, R. Amelia, and N. Fitriani, "Ruang Sisi Datar," *J. Ilm. Iqra'*, vol. 12 (2), p. 106, 2021.
[13] Anugrah and H. Pujiastuti, "Analisis Kesalahan Siswa dalam Menyelesaikan Soal HOTS Bangun Ruang Sisi Lengkung," *J. Pendidik. Mat.*, vol. 11 (2), pp. 213–225, 2020.
[14] V. H. Saputra and P. Permata, "Media Pembelajaran Interaktif Menggunakan Macromedia Flash Pada Materi Bangun Ruang," *WACANA Akad. Maj. Ilm. Kependidikan*, vol. 2, no. 2, p. 116, 2018, doi: 10.30738/wa.v2i2.3184.
[15] H. Triana, P. G. Yanti, and D. Hervita, "Pengembangan Modul Ajar Bahasa Indonesia Berbasis Interdisipliner Di Kelas Bawah Sekolah Dasar Pada Kurikulum Merdeka," *J. Ilm. Mandala Educ.*, vol. 9, no. 1, pp. 504–514, 2023, doi: 10.58258/jime.v9i1.4644.
[16] N. L. Fauziyah, N. A. P. Trisna, and G. S. Maulidya, "Systematic Literature Review: Pembelajaran Matematika pada Materi Bangun Ruang di Sekolah Dasar Kelas Tinggi," *Snhrp*, pp. 975–996, 2023, [Online]. Available: https://snhrp.unipasby.ac.id/prosiding/index.php/snhrp/article/view/648
[17] I. Mustaqim, "Pemanfaatan Augmented Reality Sebagai Media Pembelajaran," *J. Pendidik. Dan Kejuru.*, vol. 13 (2), p. 174, 2016.
[18] D. Septriyanti, E. Lestari, S. Pgri, B. Lampung, and S. Kristen, "Studi Literatur: Peningkatan Minat Belajar Siswa Menggunakan Media Pembelajaran Augmented Reality Dengan Pendekatan Saintifik," vol. 10, no. 2, p. 180, 2022.
[19] Purnamawati, *Panduan Penggunaan Media Pembelajaran Mobile Augmented Reality (MAR)*. Makasar: Universitas Negeri Makasar, 2021.
[20] E. Tasrif, "Pemanfaatan Media Pembelajaran Berbasis Augmented Reality Menggunakan Aplikasi Ar_Jarkom Pada Mata Kuliah Instalasi Jaringan Komputer," *J. Konseling dan Pendidik.*, vol. 8 (3), pp. 217–223, 2020.
[21] Setyawan, "Augmented Reality Dalam Pembelajaran IPA Bagi Siswa SD," *J. Teknol. Pendidik.*, vol. 07 (01), pp. 78–90, 2019.
[22] A. Ihsan, M. Munawir, and F. Amir, "Implementasi Augmented Reality Sebagai Media Pembelajaran Pengenalan Operasi Hitung Matematika Pada TK atau Paud Permata Bunda Langsa," *JURUTERA-Jurnal Umum Tek. …*, 2017, [Online]. Available: https://www.ejurnalunsam.id/index.php/jurutera/article/view/1580
[23] F. K. Sari, F. Farida, and M. Syazali, "Pengembangan Media Pembelajaran (Modul) berbantuan Geogebra Pokok Bahasan Turunan," *Al-Jabar J. Pendidik. Mat.*, vol. 7, no. 2, pp. 135–152, 2016, doi: 10.24042/ajpm.v7i2.24.
[24] D. Aprilia and M. Zainil, "Pengembangan Media Pembelajaran Bangun Ruang Berbasis GeoGebra untuk Meningkatkan Hasil Belajar Peserta Didik Kelas V SD," *e-Jurnal Inov. Pembelajaran Sekol. Dasar*, vol. 10, no. 2, p. 1, 2023, doi: 10.24036/e-jipsd.v10i2.10390.
[25] S. Sungkono, "Pengembangan Instrumen Evaluasi Media Modul Pembelajaran," *Maj. Ilm. Pembelajaran*, p. 8 (2), 2012.