

Development of an Educational Game on Quadrilaterals for Grade VII MTS Students

Nurul Laily Fadilah¹, Arini Hidayati²

¹² Universitas Nurul Jadid, Indonesia

* Correspondence e-mail; nurullailyfadilah@gmail.com, arinda3Lreza@gmail.com

Article history

Submitted: 2026/06/01; Revised: 2026/07/11; Accepted: 2026/07/29

Abstract

This study aims to develop an Android-based educational game on quadrilateral flat shapes for seventh-grade students of MTs Nurud Da'wah and to determine its validity, practicality, and effectiveness as a mathematics learning medium. The research employed a Research and Development (R&D) approach using the ADDIE model, consisting of analysis, design, development, implementation, and evaluation stages. The research subjects involved 15 seventh-grade students. Data were collected through expert validation sheets, student response questionnaires, and learning outcome tests. The developed product was evaluated by media and material experts, obtaining validity percentages of 75% and 82%, respectively. The practicality test based on student responses reached 85%, indicating that the educational game was highly practical to use. The effectiveness test showed that 11 out of 15 students achieved the Minimum Mastery Criterion (KKM), resulting in a mastery percentage of 78.67%. The findings indicate that the developed educational game is feasible, practical, and effective for supporting mathematics learning, particularly in improving students' understanding of quadrilateral flat shape concepts through interactive and engaging activities.

Keywords

Educational Game; Quadrilateral Shapes; Android Learning Media; Mathematics Learning; ADDIE Model



© 2026 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution 4.0 International (CC BY SA) license, <https://creativecommons.org/licenses/by-sa/4.0/>.

INTRODUCTION

Mathematics is one of the subjects that holds an important role in the world of education because it trains logical, critical, systematic, and creative thinking skills. One of the mathematical topics taught at the Junior High School level (SMP/MTs) is quadrilateral flat shapes. This material covers various types of flat shapes, such as squares, rectangles, parallelograms, rhombuses, kites, and trapezoids, each having different properties, areas, and perimeters. Understanding quadrilateral flat shape material is crucial because it serves as the foundation for studying geometry concepts at the next level (Desmayanasari & Hardianti, 2021).

However, in reality, many students still experience difficulties in understanding the concept of quadrilateral flat shapes, particularly in determining the area, perimeter, and the specific properties of each shape. Some students tend to memorize formulas without understanding the underlying concepts, thereby facing difficulties when confronted with varied or problem-solving questions (Widodo, 2024). Based on information obtained from the mathematics teacher at MTs Nurud Da'wah, it was found that a number of grade VII students still face difficulties in comprehending quadrilateral flat shape material. These difficulties are evident from the students' low ability to distinguish the properties of flat shapes and to determine the correct formula to solve area and perimeter problems. In addition, the learning process is still dominated by the lecture method and the use of textbooks, making students less active and easily bored during mathematics lessons.

On the other hand, most students are already accustomed to using Android-based devices in their daily lives. However, the utilization of technology as an interactive learning medium remains suboptimal. Therefore, an engaging learning medium that aligns with student characteristics is needed to increase their motivation and understanding of quadrilateral flat shape material. One medium that can be utilized is an educational game. Educational games are capable of combining learning and play elements so that the learning process becomes more interactive, fun, and far from boring. Through educational games, students can study quadrilateral flat shape concepts in a more visual and appealing way, which is expected to enhance their understanding of the material being taught. Based on these problems, the researcher is interested in conducting a study titled "Development of a Quadrilateral Flat Shape Educational Game for Grade VII Students of MTs Nurud Da'wah" as an effort to produce an innovative, engaging learning medium that meets students' needs.

METHODS

This research is a type of development research or research and development (R&D) using the ADDIE model. This research method is intended to produce or create a specific product and then test the effectiveness of that product when implemented (Faisal & Puspita, 2023). The ADDIE research model was selected because it does not require a relatively long time and the necessary budget is not overly large (Karseno, et al., 2021). This model involves 5 stages which include: Analysis Stage; Design Stage; Development Stage; Implementation Stage; and Evaluation Stage (Yohannes, 2021).

The trial subjects in this development research were grade VII students of MTs Nurud Da'wah on a limited scale involving 15 students. The data types consist of qualitative data in the form of advice and suggestions for product improvement, as well as quantitative data in the form of instrument feasibility scores using a modified Likert scale with scores from 1 to 5. Validity, practicality, and effectiveness data were analyzed using the percentage formula:

$$P = \frac{\sum R}{N} \times 100\%$$

where P is the percentage, $\sum R$ is the total score of answers obtained, and N is the total maximum score. Validity was measured through media and material experts, practicality was measured through student response questionnaires, and effectiveness was measured through a learning test (post-test) conditional on the school's Minimum Mastery Criterion (KKM) of 75.

FINDINGS AND DISCUSSION

Research and Development

Media development was carried out using the ADDIE model. The analysis stage identified the learning difficulties of grade VII students regarding the properties and formulas of quadrilaterals, the characteristics of students who favor interactive visuals, and mapped out 7 main sub-materials of quadrilateral flat shapes. The design stage compiled the initial concept of the media, navigation menus, preparing the GDevelop platform, content design, and making visual storyboards (Home, Menu, Material, Instructions, CP & ATP, Profile, Puzzle, Multiple-Choice Exercises, and Essay Exercises). The development stage realized the Android-based game (APK) in GDevelop, which features a combination of text, illustrative images, animation, spoken voice narration, flat shape puzzle-assembling challenges, and practice questions.

After the product was successfully developed, validation was carried out to assess the product's feasibility level.

Media Expert Validation: Showed a total score of 30 out of a maximum score of 40, thereby reaching a percentage of 75% with a "Valid" criterion. Some inputs from the expert included adjusting the text size so it is easy to read, adding symbols and labels to geometric images (base, height, side), fixing material navigation buttons, and stopping the teacher's animation once the explanation is finished so as not to distract students. Material Expert Validation: Showed a total score of 41 out of a maximum score of 50, thereby reaching a percentage of 82% with a "Very Valid" criterion. Inputs from the material expert included improving the clarity of flat shape

drawings, adding introductory descriptions of the types of shapes before entering the formulas, and standardizing the final scoring system.

Student Response Questionnaire Validation: Obtained a score of 33 out of a maximum score of 50 with a percentage achievement of 66%, status "Valid". Test Question Validation: Obtained a score of 23 out of a maximum score of 30 with a percentage achievement of 76.6%, status "Valid".

The implementation stage was carried out by testing the APK application with 15 grade VII students of MTs Nurud Da'wah through giving a pre-test, conducting the learning process using the interactive educational game, a post-test of learning outcomes, and filling out user response questionnaires. Media Practicality: The results of the student response questionnaire obtained a total score of 359 out of a maximum score of 420, resulting in a practicality percentage of 85% with a "Very Practical" criterion. Media Effectiveness: The post-test results showed that out of 15 students, 11 students successfully achieved a mastery score of ≥ 75 (KKM), while 4 students were declared not yet mastered. The total accumulated post-test score was 1180 out of a maximum score of 1500, yielding a learning mastery percentage of 78.67%, which falls under the "Very Effective" criterion.

Figures, Tables and Schemes

All supporting data are presented through the instrument visualization tables below.

Table 1. Data of Media Expert Validation Analysis Results

Aspect	Indicator	Score	Maximum Score
Display Assessment	Clarity of user instructions	4	5
	Ease of using the media	4	5
	Appropriateness of color, image, and text combinations	4	5
	Clarity of text in reading passages	2	5
	Clarity of images in emphasizing material and questions	2	5
	Suitability of color, image, and text choices with student characteristics	5	5
Language Assessment	Correctness of Indonesian language usage in material and questions	4	5
	The language used is easy to understand	5	5

Total	30	40
Percentage	75%	

Table 2. Data of Material Expert Validation Analysis

Aspect	Indicator	Score	Maximum Score
Material Content Assessment	The content provided is in accordance with CP and ATP	4	5
	Content in the developed media matches the quadrilateral flat shape material	4	5
	Completeness of learning materials	4	5
Student Assessment	The developed media fits the students' abilities	3	5
	The developed media matches the students' characteristics	4	5
Function Assessment	Media helps students learn through play more effectively	4	5
	Media makes it easier for students to study quadrilateral flat shape material	5	5
	Media can motivate students for independent learning	5	5
Language Assessment	Good and easy-to-understand Indonesian language usage in material and questions	4	5
	Accuracy of terminology usage	4	5
Total		41	50
Percentage		82%	

Discussion

Based on the research results, the educational game for quadrilateral flat shape material has proven to be successfully and systematically developed following the ADDIE model. Through the needs analysis process at MTs Nurud Da'wah, this media precisely targets the fundamental constraints of grade VII students, namely the difficulty in distinguishing the properties of geometric shapes and the weakness in applying area and perimeter formulas. These problems were resolved by presenting interactive dynamic visualisations, explanatory audio, and shape reconstruction puzzle challenges.

The feasibility quality of the product's validity was proven by the evaluation results of the media expert (75% / Valid) and the material expert (82% / Very Valid). After improvements were made—including enlarging the text size on GDevelop to enhance the readability aspect—this media showed high performance in field testing. The positive response from students generated a practicality percentage reaching 85% ("Very Practical"), which confirms that the educational game's user interface system is easy to understand and motivates students to learn independently. In terms of cognitive effectiveness output, a real leap in scores was visible from the pre-test to the post-test results. The success of 11 out of 15 students surpassing the KKM triggered an effectiveness percentage of 78.67% ("Very Effective"). This confirms that integrating game elements into mathematics learning content can transform conceptual understanding into something concrete and meaningful. The main advantage of this educational game lies in its operational nature based on Android, which increases learning flexibility anytime, its step-by-step material design, and interactive practice evaluations. However, this media has limitations in the form of a still limited variety of questions and its operations are highly dependent on the availability of gadgets

CONCLUSION

This development research produces an Android-based learning medium in the form of an educational game on quadrilateral flat shape material for grade VII MTs students, which was systematically developed using the ADDIE model. The product is declared feasible, practical, and effective for use in mathematics learning. Validation from the media expert obtained 75% (Valid) and the material expert obtained 82% (Very Valid). Students' responses during the field trial achieved a practicality score of 85% (Very Practical), indicating the media is engaging and easy to operate. The product's effectiveness was proven through the achievement of student learning outcomes with a post-test mastery percentage of 78.67% (Very Effective), where most students successfully surpassed the Minimum Mastery Criterion (KKM).

REFERENCES

- Desmayanasari, Dwi, and Desrina Hardianti. 2021. "DESAIN DIDAKTIS SIFAT-SIFAT BANGUN DATAR SEGIEMPAT." *Gammath : Jurnal Ilmiah Program Studi Pendidikan Matematika* 6 (1): 18–31. <https://doi.org/10.32528/gammath.v6i1.5394>.
- Faisal, Faisal, and Rita Puspita. 2023. "Bahan Ajar Membaca Kritis Kreatif Berbasis

- Model Somatic Auditory Visual and Intellectual.” *Paedagogi: Jurnal Kajian Ilmu Pendidikan (e-journal)* 9 (2): 173. <https://doi.org/10.24114/paedagogi.v9i2.46685>.
- Karseno, Sariyasa, and I. G. Astawan. 2021. “PENGEMBANGAN MEDIA GAME EDUKASI BERBASIS ANDROID PADA TOPIK BILANGAN BULAT KELAS VI SEKOLAH DASAR.” *Jurnal Teknologi Pembelajaran Indonesia* 11 (1): 16–25. https://doi.org/10.23887/jurnal_tp.v11i1.621.
- Widodo, Ridwan, Intan Indiati, Ali Shodiqin, and Farida Nursyahidah. 2023. “Pengembangan Media Pembelajaran Berbasis Augmented Reality Berkonteks Etnomatematika Pada Candi Borobudur.” *Imajiner: Jurnal Matematika dan Pendidikan Matematika* 5 (6): 412–22. <https://doi.org/10.26740/imajiner.v5i6.17991>.
- Yohannes, Yohannes, Siska Devella, and Meiriyama Meiriyama. 2021. “Pelatihan Pembuatan Game Menggunakan Gdevelop Untuk Siswa/i SMA Negeri 6 Palembang.” *Selaparang* 5 (1): 833–40. <https://doi.org/10.31764/jpmb.v5i1.6333>.