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Research Article

Development of the 'Selangkah Mengelilingi Salatiga' (SEMESTA) Board Game to Improve Fourth-Grade Primary School Students' Problem-Solving Skills in Plane Geometry

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ABSTRACT

This study was motivated by the lack of students' problem-solving abilities in plane geometry and the limited availability of appropriate learning media. These factors contribute to low learning outcomes in problem-solving and minimal student engagement during the learning process. The development of the Selangkah Mengelilingi Salatiga (SEMESTA) board game aims to address these issues. The study was conducted at SDN Tingkir Lor 02 using a Research and Development (R&D) method with the ADDIE development model, which consists of five stages: analysis, design, development, implementation, and evaluation. Data collection techniques included observation, interviews, validation questionnaires, response questionnaires, pre-tests, and post-tests. Media validation results reached 94.66%, categorized as "Highly Valid," and material validation scored 69.33%, categorized as "Valid." The practicality test results were 98.66% from teachers and 73.79% from students, indicating that the media was "Highly Practical." A significant improvement in problem-solving ability was observed, as indicated by an N-Gain score of 0.6701, categorizing the media as "Moderately Effective," with the average pre-test score rising from 42.93 to 78.79 in the post-test. It can be concluded that there is a significant difference between the pre-test and post-test results, and thus, the SEMESTA board game is suitable for use in the learning process.

Keywords: Board Game; Plane Geometry; Problem Solving; 'Selangkah Mengelilingi Salatiga; Semesta Game

1. INTRODUCTION

Problem-solving focuses on developing students' abilities to face situations using critical thinking, creativity, and analytical skills. In the field of education, problem-solving is not only about teaching students to find solutions to specific issues but also about training them to think logically and systematically. According to Saad and Ghani in Shodiqin et al. (2020), solving a problem requires going through a planned process and then executing that plan to resolve the issue. Problem-solving processes are commonly found in mathematics learning, which means students must possess this skill both in academic contexts and real-life situations. Among the 77 countries participating in mathematics proficiency assessments, Indonesia ranked 71st, with over 70% of students performing at level 1 or below, and most still falling under level 2. Data from the Trends in International Mathematics and Science Study (TIMSS), the Progress in International Reading Literacy Study (PIRLS) for the years 2007 and 2011, and the Indonesian Ministry of Education and Culture (Kemendikbud) in 2012 (as cited in Nursyarifah et al., 2017), show that more than 95% of Indonesian students are only capable of mid-level thinking, meaning they are not yet able to engage in higher-order thinking. Since problem-solving involves higher-order thinking processes, this reveals a lack of understanding and insufficient training in problem-solving skills in mathematics education. Therefore, continuous and structured training is needed to develop students' problem-solving abilities.

Mathematics in primary education plays a crucial role in developing students' foundational abilities in logical, mathematical, and analytical thinking. This is supported by Fahrurrozi and Hamdi in Aini et al. (2023), who state that mathematics is the study of patterns, structures, logical analysis, and calculation using these patterns and structures. At this stage, students are introduced to basic mathematical concepts such as addition, subtraction, multiplication, division, and the understanding of plane and solid figures. A strong grasp of plane geometry is essential as it forms the foundation for understanding more complex geometric concepts at higher educational levels (Wijaksono, 2025). Students at the primary level are introduced to various types of plane figures such as squares, rectangles, triangles, and circles, as well as related concepts like area, perimeter, and the unique properties of each shape. Developing mathematical problem-solving skills can be achieved by gradually introducing students to problem-based tasks, allowing them to master mathematical concepts through guided inquiry. Mathematical challenges are often found in lengthy and complex word problems, requiring students to analyze and devise appropriate solutions. Rostika and Junita in Aulia et al. (2023) argue that many teachers tend to focus on providing quick formulas that help students solve concept-based questions, rather than encouraging deeper problem-

solving processes. This tendency can hinder the development of students' problem-solving abilities, which are essential for cultivating creative, critical, and higher-order thinking skills. Another factor that hampers the development of problem-solving skills is the perception among students that mathematics is inherently difficult and even intimidating, which negatively impacts their motivation to learn the subject. Siregar, as cited in Yuliyani et al. (2023), emphasizes that a positive attitude is a key factor in supporting students' understanding of mathematics, which is often perceived as a difficult subject. If a positive mindset is instilled, it can significantly boost students' motivation and improve their mathematical problem-solving abilities. Kifayah and Kusuma (2024) demonstrated that the development of contextual learning media such as BIANKA effectively enhances students' mathematical skills, supporting the development of similar media like SEMESTA to improve problem-solving abilities in plane geometry.

One of the efforts that can be made to improve students' mathematical problem-solving abilities is the use of instructional media during the learning process. In this context, learning media play a crucial role in supporting effective mathematics instruction. This is supported by Andrijati in Astuti & Ulfah (2019), who states that the use of learning media in mathematics education is essential, as it aligns with students' stages of thinking in grasping mathematical concepts and supports the teaching and learning process in achieving educational goals. Hamalik in Aifah et al. (2020) also notes that the use of instructional media in classroom learning can produce positive psychological effects on students, such as stimulating learning activities and fostering interest and motivation to participate in learning. According to Nugroho and Rahmawati in Soleha (2024), the use of educational game-based media in the learning process has been proven to significantly increase student engagement. Game-based learning media can also promote teamwork and collaboration among students, particularly when implemented in group activities aimed at achieving a shared goal. One example of such media is the board game, a form of gameplay conducted on a flat surface with designated rules and tools that guide the activity. Maulana & Asmarani in Muazizah & Ningsih (2025) explain that a board game involves movable and interactive components placed on a surface that is marked or divided according to the game's rules. Maulana and Asmarani in Ningtyas (2023) further describe board games as media that can be effectively integrated into learning activities to help students focus, stay engaged, and interact with others, thereby making the learning experience more dynamic and participatory. In this study, the use of a board game will involve tangram as both a challenge and a concrete learning tool made up of various plane figures. Tangrams are puzzle-like games composed of basic geometric shapes, typically including triangles, parallelograms, and squares. The use of tangrams can serve as an educational tool that incorporates elements of geometry. According to Fitria and Suyadi in Indiati et al. (2021), tangram media can be used to facilitate geometry learning, as it helps students understand geometric concepts more concretely. Mastery of plane figure concepts is essential, as it forms the foundation for solving more complex geometric problems in higher levels of education.

2. RESEARCH METHOD

This study employed a Research and Development (R&D) approach aimed at producing a board game learning medium to improve students' mathematical problem-solving abilities in the topic of plane figures. According to Sugiyono, as cited in Darma Putra & Sasmita Dahlan (2022), development research not only involves creating a product but also testing its feasibility, practicality, and effectiveness. The model used in this study was the ADDIE development model (Analysis, Design, Development, Implementation, Evaluation), developed by Reiser and Molenda (as cited in Rohaeni, 2020). This model was chosen due to its systematic and flexible nature, making it well-suited for instructional media development. Hidayat & Nizar (2021) also support the view that ADDIE is capable of producing effective and applicable instructional designs. The first stage, analysis, was conducted through observations, interviews, and documentation at SD Negeri Tingkir Lor 02 and SD Negeri Kumpulrejo 02 to identify student needs and the relevance of the material. The design stage involved creating the Selangkah Mengelilingi Salatiga (SEMESTA) board game, which integrates local Salatiga icons and tangram gameplay to stimulate understanding of plane geometry. The development stage included prototype creation, validation by subject matter and media experts, and product revisions. Implementation was carried out through limited trials at SDN Kumpulrejo 02 (11 students) and extended trials at SDN Tingkir Lor 02 (29 students). Evaluation was conducted to assess the media's validity, practicality, and effectiveness based on pre-test and post-test results. Data collection instruments included expert validation questionnaires, teacher and student response questionnaires, and test items. Pre-test and post-test questions were analyzed using SPSS 22 to test validity, reliability, item difficulty, and discrimination index. Qualitative data were obtained from expert, teacher, and student feedback and analyzed descriptively. Effectiveness was analyzed through prerequisite tests (normality and homogeneity), paired sample t-tests, and N-Gain tests. Effectiveness interpretation was based on improvements in learning outcomes and the average N-Gain score, categorized as low, moderate, or high. The media was considered effective if it met the criteria for high effectiveness and was validated and deemed practical by both experts and users.

3. RESULTS AND DISCUSSION

This study employed a Research and Development (R&D) approach aimed at producing an educational product or innovation. The research focused on the development, validity, practicality, and effectiveness of the media being created. The product developed in this study was an instructional board game called SEMESTA, an acronym for Selangkah Mengelilingi Salatiga (A Step Around Salatiga), which reflects the theme of the game. This learning media takes the form of a board game similar to Snakes and Ladders, consisting of spaces containing information, challenges, and problem-solving stations that players must complete to win the game. The purpose of developing the SEMESTA board game was to improve students' problem-solving skills in plane geometry, based on George Polya's problem-solving theory. The development of this media followed the ADDIE model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation. The

findings from each of these five stages of the ADDIE model are described as follows.

3.1 Analysis

The analysis stage in the ADDIE model was carried out through direct classroom observations in a fourth-grade primary school, which revealed that the learning process was still predominantly teacher-centered, relying on conventional media. This resulted in students becoming easily bored and less motivated. The observations also indicated that students had diverse characteristics and required a more engaging and interactive learning approach. To gain further insights into student characteristics and their ability to understand mathematics—specifically plane geometry—the researcher conducted interviews with classroom teachers. The teachers noted that students tended to be more enthusiastic when the learning media used was visually appealing and easy to understand. In addition, many students were found to struggle with solving problem-based questions, both in multiple-choice and open-ended formats. Based on this analysis, the researcher designed the development of a board game inspired by the Snakes and Ladders format, tailored to problem-solving indicators based on George Polya's theory and contextualized to the students' local environment.

3.2 Design

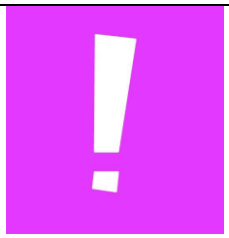
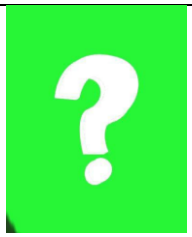
The design stage was a continuation of the needs analysis and assessment of student characteristics at the research site. In this phase, the researcher designed a board game learning medium named Selangkah Mengelilingi Salatiga (SEMESTA). The game's theme was inspired by popular landmarks in the city of Salatiga, which are familiar to students, thus helping them better understand the context of the problems presented in the game. The game was designed in the style of Snakes and Ladders, but with educational elements integrated, including problem cards, challenge cards, and information cards. The problem cards contained contextual problem-solving questions based on real-life locations in Salatiga. The challenge cards featured quiz questions, properties and formulas related to plane figures (such as triangles, squares, and parallelograms), and tangram-based activities. The tangram consisted of seven geometric shapes that students were required to arrange into specific patterns as part of the challenge. Meanwhile, the information cards provided formulas and problem-solving tips to support the learning process. This instructional medium was also equipped with a game manual and was designed to train students' problem-solving abilities, with reaching the finish line symbolizing success in both playing and learning.

Figure 1. *Board Game* SEMESTA

This image illustrates the SEMESTA board game, in which the product is made from yellow board material and overlaid with a custom-designed board game sticker. The choice of yellow board material ensures safety and practicality, as it is both durable and lightweight, making it easy to carry. The game is in the form of a foldable board, allowing for convenient portability. When fully opened, the board game measures 20 x 42 cm, and when folded, it measures 10 x 21 cm. The game board features various squares containing icons, such as running figures, command icons, question marks, stars, and clearly marked start and finish lines. The following table provides a detailed explanation of each icon:

Table 1. Ikon Petak *Board Game* SEMESTA

No	Figure	Description	No	Figure	Description
1		Running Figure Icon: This represents a free space, allowing the player to proceed to the next dice roll without drawing any card.	4		Star Icon: This space requires the player to draw a problem card. The player must correctly respond to the instructions on the card in order to proceed to the next space.

2		Command Icon: This space requires the player to draw a challenge card. The player must correctly follow the instructions on the card to advance to the next space.	5		Start Line: The initial space where all players begin before starting the game.
3		Question Mark Icon: This space prompts the player to draw an information card. The player is expected to read and understand the content, which provides supporting material that can enhance their knowledge and help them answer questions on future spaces.	6		Finish Line: The final space on the board, marking the endpoint where a player wins the game.

In the design stage, the researcher developed the Selangkah Mengelilingi Salatiga (SEMESTA) board game as an instructional medium, incorporating landmarks from the city of Salatiga as contextual elements in the gameplay. The game consists of various components, including a game board, problem cards, challenge cards, information cards, answer cards, pawns, dice, a timer, and a guidebook. Each card serves a specific function: information cards contain formulas and problem-solving tips, challenge cards include quizzes on plane figures and tangram activities, problem cards present contextual mathematical problems, and answer cards are used to validate students' responses. The timer is used to limit task completion time, while the pawns and dice facilitate player movement across the game board. The entire set is stored in a custom-designed bag and box bearing the SEMESTA logo for easy transportation and distribution. The guidebook provides complete instructions, including product descriptions, materials and tools, gameplay mechanics, and rules. The game is played in groups, using a turn-based system, where the first player to complete the challenges and reach the finish line is declared the winner. The learning objectives focus on students' ability to identify characteristics, calculate area, compose shapes, and solve problems related to triangles, squares, and parallelograms. The instructional module was designed using the Team Game Tournament (TGT) approach and aligned with the learning outcomes of the national curriculum and the *Profil Pelajar Pancasila*, ensuring that the media is contextual, collaborative, and meaningful for primary school students.

3.3 Development

The next phase of the ADDIE development model is the development stage. This stage focuses on the creation of the SEMESTA board game media, incorporating problem-solving content related to plane geometry, as previously outlined in the earlier phases. The development of this media requires approval from the academic advisor to ensure its feasibility before proceeding with validation by subject matter and media experts.

Table 2. Expert Validation

No.	Name	Validator Type	Percentage	Description
1	Yohana Setiawan, M.Pd.	Content Expert	69,33%	Valid
2	Dr. Herry Sanoto, S.Si., M.Pd.	Media Expert	94,66%	Highly Valid

The validation results indicated that the media was rated as "Valid" by the content expert, with a score percentage of 69.33%, and "Highly Valid" by the media expert, with a score of 94.66%. The content validation was conducted by Yohana Setiawan, M.Pd., a lecturer in the Primary School Teacher Education Program at the Faculty of Teacher Training and Education (FKIP), Satya Wacana Christian University. The evaluation included 15 indicators across four aspects: content relevance, content coherence, alignment with student characteristics, and language usage. These aspects were assessed using a Likert scale (1–5), with a total score of 52 out of a maximum of 75. Based on the percentage calculation, the content expert concluded that the media was "valid," with minor revisions recommended, such as the need to provide more explicit information within the product and to strengthen the integration of George Polya's problem-solving theory within the problem content. This validation demonstrates that the product is suitable for instructional use, provided that the suggested improvements are incorporated.

Table 3. Media Validation Results

No.	Criteria	Evaluated Aspects	Score
1	Media Appearance	1. The SEMESTA board game theme is appealing to play	5
		2. Appropriateness of font choice and layout composition	5

		3. Relevance of images with the SEMESTA board game theme	5
		4. Images are suitable for children's perspectives	5
		5. Visual presentation attracts students' attention	5
2	Graphic Feasibility	6. Font size is clear and easy for students to read	5
		7. Language used is understandable and unambiguous for students	5
		8. Color application is appropriate and harmonious	5
		9. Image layout is appropriate	4
3	Media Usability	10. The SEMESTA board game excites students to learn about plane figures	4
		11. The game rules are fair and suitable for competitive play	4
		12. The board game is easy to understand and play	5
		13. Supporting tools (cards, tangram, dice) are well-integrated in the gameplay	5
4	Usage Safety	14. Materials used are safe for students	5
		15. The board game is durable for long-term use	4
		Total Score	**71**
		Percentage	**94.66%**
		Remarks: -	

Media validation by Dr. Herry Sanoto, S.Si., M.Pd. resulted in a score of 94.66% and was categorized as "highly valid," requiring no revisions. Meanwhile, content validation by Yohana Setiawan, M.Pd. produced two suggestions: the addition of information cards to reinforce the material and a revision of the looking back indicator in Polya's theory to emphasize the process rather than solely the outcome. Both suggestions were addressed and incorporated by the researcher into the final version of the SEMESTA board game.

3.4 Implementation

The implementation stage was carried out through two phases of testing: limited trials and large-scale trials. The limited trial took place at SD Negeri Kumpulrejo 02 with 11 students over three days (April 28–30, 2025), involving pre-test administration, content delivery, and a post-test to evaluate the feasibility of the instruments. The large-scale trial was conducted at SD Negeri Tingkir Lor 02 with 29 students from May 5–7, 2025. On the first day, a pre-test was administered, followed by content presentation and the group-based application of the SEMESTA board game on the second day. The third day concluded with a post-test and the distribution of response questionnaires to both teachers and students. The objective of this stage was to evaluate the practicality and effectiveness of the learning media in enhancing students' problem-solving skills related to plane geometry.

3.5 Evaluation

At this stage, quantitative data analysis was conducted based on the previous phases to determine whether the media developed by the researcher is feasible for use in the learning process. The results of this analysis serve as the basis for concluding the practicality, validity, and overall appropriateness of the SEMESTA board game as an instructional tool.

3.5.1 Effectiveness Test of the SEMESTA Board Game Media

Table 4. Normality Test Results

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pre_test	.198	29	.005	.940	29	.100
Post_test	.122	29	.200*	.968	29	.515

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Based on the normality test results using SPSS 22, the Shapiro-Wilk significance values were 0.100 for the pre-test and 0.515 for the post-test, both of which are greater than 0.05. This indicates that the data are normally distributed, thus meeting the assumptions required for conducting subsequent homogeneity and mean difference tests.

Table 5. Homogeneity Test Results

Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
Results	Based on Mean	.001	1	56	.977
	Based on Median	.047	1	56	.829
	Based on Median and with adjusted df	.047	1	55.809	.829
	Based on trimmed mean	.002	1	56	.965

The homogeneity test yielded a significance value of 0.977, which is greater than 0.05. This indicates that the data are homogeneous and suitable for further analysis using the paired sample t-test.

Table 6. Paired Samples Test Results

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Pre_test Post_test	-35.862	11.858	2.202	-40.373	-31.351	-16.286	28	.000

The results of the paired sample t-test showed a Sig. (2-tailed) value of 0.000, which is less than 0.05. This indicates a significant difference between the learning outcomes before and after the use of the SEMESTA board game media, with a mean difference of -35.862.

Table 7. Uji *Paired Sample T-Test*

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre_test	42.93	29	17.808	3.307
	Post_test	78.79	29	16.145	2.998

The test results showed a significant increase in the average score from the pre-test (42.93) to the post-test (78.79), indicating that the use of the SEMESTA board game media had a positive impact on students' learning outcomes.

Table 8. N-Gain Score Results

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
NGain	29	.20	1.00	.6701	.22036
Valid N (listwise)	29				

Based on the table, the overall average N-Gain score was 0.6701. According to the interpretation scale ($0.55 < g \leq 0.75$), this N-Gain value falls into the "moderately effective" category.

3.5.2 *Practicality Test of the SEMESTA Board Game Media*

Table 9. Teacher Response Questionnaire Score Results

No.	Criteria	Indicators	Assessed Aspects	Score
1	Media	Appearance	The appearance and theme of the SEMESTA board game media are attractive	**5**
			The images used in the SEMESTA board game media are appropriate to the theme or material	**4**

			The language used in the SEMESTA board game media is simple and easy to understand	**5**
			The color choices in the SEMESTA board game media are suitable/harmonious	**5**
		Usage	The SEMESTA board game media is easy to use/play	**5**
			The materials used in the SEMESTA board game media are safe for students or children	**5**
			The SEMESTA board game media is durable for repeated use	**5**
		Practicality	The SEMESTA board game media is flexible (can be opened and closed)	**5**
			The SEMESTA board game media is easy to carry	**5**
2	Material	Presentation	The SEMESTA board game media can convey the material clearly	**5**
			The material in the SEMESTA board game media aligns with the basic competencies and learning objectives	**5**
			The material in the SEMESTA board game media is systematic and easy to understand	**5**
			Activities and sample questions help students understand the material	**5**
		Benefits	The SEMESTA board game media can increase students' motivation to learn	**5**
			The SEMESTA board game media can train mathematical problem-solving skills	**5**
			Total Score	**74**
			Percentage	**98,66%**

Note:
The SEMESTA board game media is very engaging and supports learning activities exceptionally well. Hopefully, it can be reproduced (distributed) to assist both students and educators in teaching and learning activities by developing various series.

Based on the questionnaire results, the teacher gave a score of 98.66%, indicating that the SEMESTA board game media is categorized as "very practical" for use in learning activities. Meanwhile, responses from fourth-grade students showed an average score of 73.79%, which is categorized as "practical" based on assessments of the media's appearance, ease of use, and usefulness in the learning process.

Table 10. Student Response Questionnaire Score Assessment

No	Name	Score	Results	Descriptions	No	Name	Score	Results	Descriptions
1	Delisa	11	73,3%	Practical	16	Anindya	14	93,3%	Very Practical
2	Alba	5	33,3%	Less Practical	17	Daffa A	11	73,3%	Practical
3	Naira	11	73,3%	Practical	18	Putra	11	73,3%	Practical
4	Olla	8	53,3%	Fairly Practical	19	Jero	13	86,6%	Very Practical
5	Vevina	11	73,3%	Practical	20	Fay	12	80%	Very Practical
6	Zhafran	7	46,6%	Fairly Practical	21	Majid	6	40%	Fairly Practical
7	Sheyla	13	86,6%	Very Practical	22	Chello	10	66,6%	Practical
8	Daffa M	15	100%	Very Practical	23	Albab	11	73,3%	Practical
9	Mufid	13	86,6%	Very Practical	24	Hilmi	11	73,3%	Practical
10	Anschel	8	53,3%	Fairly Practical	25	Nevan	11	73,3%	Practical
11	Arya	13	86,6%	Very Practical	26	Rasya	10	66,6%	Practical
12	Rafo	10	66,6%	Practical	27	Lakhiq	14	93,3%	Very Practical
13	Shanin	12	80%	Very Practical	28	Ilya	12	80%	Very Practical
14	Nadine	11	73,3%	Practical	29	Fayolla	12	80%	Very Practical
15	Silna	15	100%	Very Practical					
							Rata-rata	**73,79%**	**Praktis**

Based on the results of the student questionnaire, an average score of 73.79% was obtained, indicating that the SEMESTA board game media is categorized as "practical" for use in the learning process.

3.6 Discussion

This study demonstrates that the development of the "Selangkah Mengelilingi Salatiga" (SEMESTA) board game successfully addresses the need for enjoyable and contextual mathematics learning in elementary schools. Based on observations and interviews, it was found that students had difficulty understanding the concept of plane figures and were not yet accustomed to solving problem-solving questions. Through a well-planned needs analysis process, the researcher designed a context-based board game using icons from the city of Salatiga-packaged in an engaging manner suited to the characteristics of elementary students. This game not only presents contextual problems but also includes challenges, informative content, and the use of concrete media such as tangrams, which directly stimulate students' critical and creative thinking skills. This approach aligns with the principle that learning becomes more meaningful when students are actively

involved and the material is connected to real-life experiences.

The implementation and evaluation results show that this learning media effectively supports the improvement of students' learning processes in solving problem-solving tasks. All stages of Polya's theory—understanding the problem, planning a strategy, carrying out the strategy, and reviewing the solution—are structurally facilitated through the game's flow. Students begin to identify the core of the problem, determine solution steps, and reflect on the processes they have undertaken. In addition to enhancing their understanding of plane figures, the use of this board game also fosters collaborative skills, as students play in groups and must engage in discussion to overcome challenges. Furthermore, teachers noted that this approach helps them deliver the material more effectively and creates a more dynamic and participatory classroom atmosphere. With interactive and enjoyable media, learning becomes less monotonous, and students are more motivated to grasp the material thoroughly.However, the implementation of this media also faced several challenges. There were still imbalances in group roles, with some students being less active in discussions, and the questions tended to focus more on the area of plane figures than on perimeter. Additionally, time management during the game and students' enthusiasm, which was sometimes difficult to control, made the gameplay less than optimal. This study was also limited to one school, so the results cannot be generalized widely. Therefore, future research is recommended to further develop the content, instructional design, and school coverage so that the board game media can be continuously improved and more widely implemented in elementary mathematics learning.

4. CONCLUSION

This study aimed to develop a board game-based learning media titled Selangkah Mengelilingi Salatiga (SEMESTA) to enhance fourth-grade elementary students' problem-solving skills in plane geometry. The development process followed the ADDIE model, which consists of five systematic stages: analyzing students' needs and characteristics, designing the media, developing and validating it with experts, implementing it through limited and extended trials, and evaluating the media's effectiveness in the context of mathematics learning. The research results indicated that the SEMESTA board game is valid and feasible for use. Validation by content experts yielded a score of 69.33% with the criterion "Valid," while validation by media experts scored 94.66%, categorized as "Very Valid." The media was also found to be practical based on teacher responses (98.66% – "Very Practical") and student responses (73.79% – "Practical"). In terms of effectiveness, there was a significant increase in student learning outcomes, with the average pre-test score rising from 42.39 to a post-test average of 78.79. An N-Gain score of 0.6701 indicates that the media was "Moderately Effective" in improving mathematical problem-solving abilities, in line with George Polya's theory. Thus, the SEMESTA board game has proven to support an interactive, enjoyable, and contextual learning process. The media encourages active student engagement, strengthens understanding of geometric concepts, and trains critical and strategic thinking skills. The researcher recommends that teachers utilize SEMESTA or develop similar game-based models tailored to student characteristics and local contexts. Schools are encouraged to support the integration of innovative, game-based educational media as an alternative for concrete learning. For future researchers, this media may be modified with varied content or learning themes and further developed for different educational levels to broaden its adaptability and usage.

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