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# Adventure game learning media based on maritime Malay cultural: Development and effectiveness for enhancing mathematical problem-solving skills in junior high school students

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**Abstract**

Students' mathematical problem-solving skills remain a critical challenge in junior high school education, with only 5% of students able to solve problems effectively. This difficulty is compounded by abstract learning materials and a lack of engaging, culturally relevant learning media. This research project aims to develop an adventure game learning medium set in the context of Maritime Malay culture to enhance junior high school students' mathematical problem-solving abilities. The purpose of this study is to determine the validity, practicality, and effectiveness of the learning media. This study employed the ADDIE research method, consisting of five stages: analysis, design, development, implementation, and evaluation. The subjects of this study were 35 eighth-grade students from SMP Negeri 1 Tanjungpinang. The instruments used were validation, practicality, and media effectiveness sheets. Data analysis techniques use both qualitative and quantitative methods. The material expert validation results showed an average assessment of 85.6%, indicating very valid criteria. The practicality results from the student-teacher trial showed 86.5% practicality, with very practical criteria. Furthermore, the product's effectiveness, measured using the N-Gain score, obtained a value of 0.61. Based on the data obtained, adventure games with a maritime Malay cultural context that improve mathematical problem-solving skills in junior high school students meet the criteria of validity, practicality, and effectiveness, making them suitable for use as learning media in the mathematics learning process.

*Keywords:* development; adventure game; maritime Malay culture; mathematical problem solving

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## I. Introduction

In the 21st century, technology has become an integral part of human life, a fundamental need for everyone, from children to adults. The rapid development of technology has created dependency in various aspects of life (Agustian & Salsabila, 2021). Entering the era of rapid globalization and digitalization, technology education has undergone significant changes that have affected teaching methods, curriculum, and the broader perspective of education. Changes and renewal in technology education are an

obligation to respond to the developments and challenges of an era that continues progressing (Nasution, 2024).

This paradigm shift in education also extends to mathematics learning, which faces increasingly complex challenges because the characteristics of mathematical subjects require deep conceptual understanding. Mathematics is a science that requires much logic (Fatimah & Sundayana, 2022), so many students assume that mathematics lessons are difficult to understand (Indofah & Hasanudin, 2023). However, mathematics is essential and inseparable from everyday life (Diva & Purwaningrum, 2022). In learning mathematics, numeracy skills, thinking skills, problem-solving skills, and reasoning skills must be developed, which are part of the learning process in everyday life. Ramdan, Veralita, Rohaeti, & Purwasih (2018) emphasized that studying mathematics can improve students' problem-solving skills and their abilities in logical, critical, and systematic thinking.

The National Council of Teachers of Mathematics NCTM, 2000) stipulates that one of the goals of mathematics learning is to develop students' mathematical problem-solving skills. This shows that mathematics learning can be used to train students to solve various everyday problems related to mathematical concepts. The habit of students trained to think mathematically will foster a critical mindset. However, previous studies show different conditions. Research by Akbar, Hamid, Bernard, & Sugandi (2018) revealed that students' problem-solving abilities are in the low category, with achievement in the following indicators: understanding the problem 48.75%, planning a solution 40%, solving the problem 7.5%, and rechecking 0%.

Similar conditions were found at SMP Negeri 1 Tanjungpinang, as indicated by interviews with grade VIII mathematics teachers. Several crucial problems were revealed in mathematics learning, especially in mathematical problem-solving skills. The teacher stated that at the end of each sub-chapter of material, he inserted practice questions with a mathematical problem-solving type. However, among 40 students in one class, only about 5% answered the problem-solving questions perfectly. This indicates that students' mathematical problem-solving skills are still very low.

Some of the main obstacles students face include weaknesses in understanding basic mathematics and difficulties in converting story problems or case studies into mathematical models. This finding is reinforced by an interview with one of the grade VIII students, who stated that he could not explain the steps taken to solve problems and often felt confused when story problems had to be converted into mathematical form. Siregar & Restati (2017) explained that students tend to find mathematics difficult because the symbols presented are abstract, making it difficult for them to perform mathematical operations.

Based on preliminary studies conducted by researchers, it was found that from the answers given by students, they were only able to fulfill the first indicator, which was understanding the problem. However, the answers given were incorrect and did not follow the proper solution process, and there was no rechecking of the answers. This shows that the students' mathematical problem-solving abilities remain low, as the indicators of planning, implementing, and evaluating the solution were not met.

Based on interviews with teachers, many students still have difficulty solving flat-sided spatial problems, especially with cuboids and prisms, where they struggle to find the volume and surface area. This finding is in line with Awwalin's (2021) research entitled "Analysis of the Difficulties of Grade VIII Junior High School Students in Flat-sided Space Material", where the findings showed that students were less able to solve problems regarding the surface area and volume of cuboids and prisms. This difficulty is caused by students not fully understanding what is being asked in the problem, not mastering the

concepts of surface area and volume, and a lack of interest in working on the problem.

To overcome these complex problems, innovative learning media are needed to improve students' problem-solving abilities. Karimah, Rusdi, & Fachruddin (2017) explained that learning media is a means to support teachers in the teaching process, making learning more interesting, less teacher-focused, and more engaging for students. The results of teacher interviews revealed that students responded positively to game-based learning media and practice question competitions. The teacher's experience using the arisan system and games in mathematics learning increased students' enthusiasm, interest, and efforts in solving problems because they felt challenged.

Educational games are a promising solution as an effective learning medium. Rofiqoh, Puspitasari, & Nursaidah (2020) stated that educational games can serve as an effective learning medium because they help students understand complex mathematical concepts in an engaging and fun way. Widiyawati (2017) added that developing visual media for learning can help students better understand the material, and one example of effective visual media is educational games. Winarni, Naimah, & Widiyawati (2020) define educational games as game media that provide a range of learning materials to educate and guide students in a fun learning process.

The use of appropriate learning media can improve the learning process, including providing narrative-based questions or story questions related to everyday life or context (Amalia Wanabuliandari, & Rahayu, 2022). Learning by linking local materials and culture can provide meaning to mathematics learning because it connects through students' experiences and social lives, touching on the realm of art and culture (Richardo, 2017). Susanti, Sumarni, & Putri (2023) added that by raising the maritime theme, students can more easily understand the material by connecting their knowledge and its application in everyday life.

The integration of Malay maritime culture into adventure-based mathematics learning media aims to create more meaningful and contextual learning. When mathematical concepts are presented in the context of local culture, students will find it easier to understand the relationship between mathematics and the real world. The incorporation of local culture into learning content is believed to enhance students' effectiveness in understanding the material (Ramadhona, Siregar, & Alpindo, 2023). To engage and motivate students to learn, materials and problems based on Malay maritime culture are presented, focusing not only on maritime aspects but also on Malay culture in the Riau Islands, thereby increasing student involvement and motivation in solving mathematical problems. In line with this, Natasya & Izzati (2020) state that incorporating a maritime theme into the design of learning media creates a new atmosphere that can attract students' interest in learning. Additionally, incorporating Malay cultural elements aims to preserve the Malay community's cultural values from being lost amid modern developments, particularly among school-age children and the younger generation, which must begin with education (Ramadan & Putra, 2018).

Based on the complex problems described, this study aims to develop an adventure game learning media set in a maritime Malay cultural context to improve valid, practical, and effective mathematical problem-solving skills among junior high school students. This learning media is expected to help students understand flat-sided spatial structures in depth, improve their mathematical problem-solving skills, and create fun, meaningful learning experiences by integrating local cultural values.

## II. Research Method

This research is a Research and Development (R&D). Pramono (2022) stated that research and development is a scientific approach

to collecting data to develop and validate products. The research and development model researchers will use is the ADDIE model, developed by Branch, where Branch (2009) suggests that the ADDIE model is an effective and flexible approach or framework for selecting adaptive learning media.

In this study, an adventure game learning media will be developed in the context of maritime Malay culture to improve students' mathematical problem-solving skills. The research was conducted at SMP Negeri 1 Tanjungpinang with 35 students from class VIII.7 as subjects.

The data collection techniques for this research include interviews, questionnaires, and tests. The data collection instruments used are: The validation and practical sheet was conducted by mathematics education lecturers, junior high school mathematics teachers, and students to evaluate the adventure game learning media.

Table 1. Learning media validity and practical criteria

| Achievement Level | Criteria | |
|---|---|---|
| 80% < x ≤ 100% | Very Valid | Very Practical |
| 60% < x ≤ 80% | Valid | Practical |
| 40% < x ≤ 60% | Valid Enough | Moderately Practical |
| 20% < x ≤ 40% | Less Valid | Less Practical |
| 0% < x ≤ 20% | Invalid | Not Practical |

Students carried out the media effectiveness sheet by doing the mathematical problem-solving ability test through pretest and posttest, which was then used to calculate the N-Gain score obtained from the comparison between the pretest and posttest scores of mathematical problem-solving abilities. The interpretation of N-Gain results is described in Table 3.

Table 2. Effectiveness category based on n-gain score

| Achievement Level | Criteria |
|---|---|
| g > 0,7 | High |
| 0,3 ≤ g ≤ 0,7 | Medium |
| g < 0,3 | Low |

## III. Results and Discussion

The steps of making adventure game learning media within the context of maritime Malay culture to improve mathematical problem-solving skills, using the ADDIE research model, are as follows:

### Analysis

The analysis stage is carried out to identify the needs in schools. At the analysis stage, the researcher analyzes the needs, materials, and characteristics of students.

### Needs analysis

The researcher found that the mathematical problem-solving ability of class VIII students at SMP Negeri 1 Tanjungpinang remained very low, with only about 5% able to solve problems well. The main obstacles are time constraints, weak basic math, and difficulty converting story problems into mathematical models. To overcome this problem, innovative learning media based on educational games that combine elements of competition, challenge, and the context of maritime Malay culture are needed to make learning more meaningful and relevant. Therefore, the development of learning media based on adventure games with local cultural content is an urgent solution to improve students' mathematical problem-solving skills, especially with flat-sided space-building material.

### Material Analysis

The results of interviews with teachers show that students' interest and learning outcomes in flat-sided space-building materials, especially blocks and prisms, remain low due to difficulties in determining volume and surface area. The teacher has only used the maritime context in learning, such as marine products in the Riau Islands. Therefore, researchers developed an adventure game-based learning media that links the material to maritime Malay culture to strengthen the understanding of mathematical concepts and local wisdom. Learning objectives include calculating surface area and volume and solving everyday problems related to beams and

prisms, which served as the basis for developing learning media.

**Analyze Learner Characteristics**

Analysis of students' characteristics shows that teachers rarely give mathematical problem-solving problems, so students have difficulty and easily give up facing these types of problems. Interviews with teachers revealed that students' main obstacles include time constraints, basic math weaknesses, and difficulty converting story problems into mathematical models. Students also tend to give up when facing HOTS problems. Meanwhile, interviews with students showed difficulty in explaining the solution steps and confusion when converting story problems into mathematical form.

Based on the results of the entire analysis stage conducted by the researchers, it can be concluded that students have difficulty solving problems and determining the surface area and volume of flat-sided spaces, especially beams and prisms. In addition, students tend to be more interested when learning is associated with games and other learning media. Therefore, it is necessary to develop learning media in the form of adventure games within the context of maritime Malay culture, which incorporate flat-sided space-building materials to improve mathematical problem-solving skills among junior high school students.

**Design**

In this design stage, researchers developed the instruments used for the study and designed a preliminary outline of the learning media to be developed.

**Compilation of Instrument**

In developing the assessment instruments, the researchers divided them into three parts: product assessment instruments, product evaluation instruments, and knowledge assessment instruments. The product assessment instruments consisted of validation questionnaires from subject matter, media, and language experts. Product practicality instruments were followed by practicality questionnaires completed by teachers and students. Meanwhile, the student knowledge assessment instrument was designed as a pretest and posttest to measure mathematical problem-solving skills after the implementation of adventure game-based learning media.

**Game Adventure Design**

This stage involves the initial design and content of the product, which is used to develop adventure game learning media by collecting visual materials such as backgrounds, menu and button images, materials and questions, and audio materials. The initial design produces a prototype, commonly known as a prototype. The design of the adventure game product is as follows:

**Cover**

The initial display or cover of the learning media contains the player's name and login menu to start the media.


Figure 1. Cover Game adventure

**CP, TP, and Adventure Guide**

The next screen displays the Learning Objectives (TP), Learning Outcomes (CP), Adventure Instructions, and the page to start the adventure.


Figure 2. CP, TP, and adventure guide

**Adventure Points**

The next screen is an adventure point that covers understanding flat-sided shapes (blocks and prisms), tips for solving math problems, three challenges, and the finish line.

Figure 3. Adventure Points

Each part of the learning media presents issues that are relevant to Malay maritime culture. At the first point, players learn about cuboids and prisms through the context of the fishing tool 'bubu' and are given guided questions. The next point contains tips for solving mathematical problems, with example questions and steps for each. Following that, there are three challenges themed around the jong boat, the traditional Malay house of the Riau Islands, and the teak sirih. Players must complete one point to unlock the next.

**Development**

Validators then validated the compiled learning media to assess its validity. Three validators tested the learning media developed: subject matter experts, media experts, and language experts. After the developed product was declared valid, it was tested for practicality by teachers and students. After the product was declared practical, its effectiveness was tested through mathematical problem-solving tests administered to students**.**

**Product Validation Test by Expert**

Table 3 below presents the results of validation of the development of learning media in the form of adventure games with a maritime Malay cultural context to improve mathematical problem-solving skills in junior high school students, as evaluated by subject matter, media, and language experts.

Table 3. The results of validation

| Aspect | Validation Valude | Average | Criteria |
|---|---|---|---|
| Media | 82% | 85,6% | Very Valid |
| Material | 89% | | |
| Language | 90% | | |

The validation results demonstrate strong acceptance across all aspects. The media aspect score of 82% indicates that the visual design, navigation, and interactive elements effectively support learning objectives. The higher material validation score of 89% reflects successful alignment between the learning content and curriculum standards, with appropriate scaffolding of mathematical concepts. The language validation, achieving 90% suggests that the instructional language is clear, age-appropriate, and effectively communicates mathematical ideas within the cultural context. The overall average of 85.6% in the "Very Valid" category confirms that the media meets high-quality educational standards.

These validation scores suggest that expert reviewers found the integration of cultural elements meaningful rather than superficial, and that the game mechanics appropriately support rather than distract from learning objectives. The slightly lower media score compared to material and language may indicate room for improvement in technical aspects, such as sound effect variety and interactive feedback mechanisms.

**Media Expert**

The media experts involved in developing this learning media were a mathematics education lecturer from UMRAH and a teacher from SMPN 1 Tanjungpinang. The results of the media expert validation showed that the adventure game learning media were ready for testing. Still, as a validator, I suggested improvements to the sound elements and the addition of game context, so the researchers added puzzles and modified the Malay cultural background music. Validator II assessed that the media is appropriate, ready for use in learning, and suitable for testing without revisions.

**Material Expert**

The media experts involved in developing this learning material were a UMRAH mathematics education lecturer and a teacher from SMPN 1 Tanjungpinang. The comments and suggestions from the expert validators were as follows: validator I suggested improving the

language, layout, and symbols in the media. Validator II said that the product was suitable and ready to be applied, concluding that it was ideal for testing without revision

**Language Expert**

The media experts involved in developing this learning material were a UMRAH mathematics education lecturer and a teacher from SMPN 1 Tanjungpinang. From the language validation results, comments and suggestions were gathered to improve the product. The validator noted that the educational media is suitable for use but requires some improvements, specifically revising certain sentences in the press and the formulas in the material section. Additionally, Validator II stated that the educational media is appropriate and ready for application in the learning process, concluding that it is suitable for testing without revisions.

**Implementation**

The validated and refined learning media are then tested for practicality by students and teachers. The practicality test was conducted on one mathematics teacher and 35 eighth-grade students at SMPN 1 Tanjungpinang. Students were assessed by completing a response questionnaire covering several aspects, including ease of use, benefits, and appeal. This questionnaire was used to determine students' responses regarding the practicality of the adventure game learning media for students who use it. The following is a summary of the responses from teachers and students.

Table 4. The responses from teachers and students

| Aspect | Validation Valude | Average | Criteria |
|---|---|---|---|
| Teacher | 88% | 86,5% | Very Practical |
| Students | 85% | | |

After the learning media were declared practical, the next step was to test their effectiveness on 35 eighth-grade students on June 2, 2020. The researcher distributed a validated test of mathematical problem-solving skills, consisting of three essay questions. The following are the results of the pretest and posttest, which were then calculated using the n-gain value.

Table 5. The results of the pretest and posttest

| Average | | Average | Criteria |
|---|---|---|---|
| Pretest | Posttet | | |
| 32,38 | 73,95 | 0,61 | Medium |

**Evaluation**

Based on the development and implementation stages of the adventure game learning media, with the context of maritime Malay culture, to improve mathematical problem-solving skills in junior high school students, it is considered valid, practical, and effective. This learning media can improve students' problem-solving skills in mathematics. It is suitable for use as a learning media that supports the learning process while helping students understand and solve mathematical problem-solving-type questions on flat-sided spatial geometry material.

This development research produced a final product in the form of an adventure game learning medium with a Malay maritime cultural context to improve mathematical problem-solving skills in junior high school students. The learning medium developed refers to the ADDIE model developed by Dick and Care (Sholikhah & Ratu 2022).

This study began with an analysis of students' needs, materials, and characteristics to identify problems in mathematics learning in the field. The results of the analysis at SMP Negeri 1 Tanjungpinang showed that learning media such as Quizizz were considered monotonous because they consisted solely of quizzes without adequate interactive elements, in line with Srimuliyani's (2023) findings that students felt bored with digital media that focused solely on evaluation without gamification. Additionally, low motivation for learning mathematics stems from the perception that the material is abstract and irrelevant, aligning with Sudia, Masi, & Husmar (2017) research, which found that junior high school students struggle to understand

mathematical concepts due to a lack of contextualization with everyday life. These weaknesses underscore the need for more innovative and engaging learning media.

These findings are reinforced by interviews with students, which showed high levels of enthusiasm when learning was presented as games. This aligns with research by Krisma & Setyadi (2022), which found that students are more active, enthusiastic, and engaged in the learning process when provided with game-based learning media. These identified weaknesses are further supported by previous research findings indicating that the use of interactive game-based learning media can increase student learning motivation by up to 85% (Azwah, Hidayat, & Aini, 2025) and improve understanding of mathematical concepts by 86.67% (Djatmika & Praherdhiono, 2024). Therefore, these weaknesses are a strong reason why it is necessary to design more innovative and engaging learning media to address existing mathematics learning challenges.

Furthermore, the material analysis revealed specific weaknesses in learning flat-sided shapes. Based on interviews with eighth-grade mathematics teachers, students had difficulty determining the volume and surface area of cuboids and prisms because these concepts are abstract and difficult to understand. In addition, the lack of contextualization in learning was a problem, as teachers applied only a simple maritime context. This condition contradicts the opinion of Ilmiyah, Handayani, & Pramesti (2021), who state that linking material to local culture can give meaning to mathematics learning by connecting it to students' experiences and social life, which touch on the arts and culture around them. This weakness in contextualization is the basis for developing learning media with a maritime Malay cultural context closely related to the Riau Islands, to create more meaningful, contextually relevant learning.

Based on the analysis that identified these weaknesses, the design stage began with selecting the adventure game format as a solution to the existing problems. This format was chosen based on several strong theoretical and practical considerations. The adventure game format was chosen because it can overcome the problems of boredom and lack of motivation among students by presenting learning as an exciting, challenging adventure. According to the gamification theory proposed by (Srimuliyani, 2023) the use of game elements in a non-game context can significantly increase user motivation and engagement.

In the context of this product design, storyboards are an important step because they serve as a blueprint that illustrates the storyline and interactions in adventure games. Storyboards are designed to solve visualization problems by presenting abstract spatial concepts in an attractive and easy-to-understand visual form. According to Gundo (2024), good storyboards can help students understand complex concepts through systematic visual representations. In this study, the storyboard was designed by integrating elements of Malay maritime culture, such as traditional boats, stilt houses, betel nut containers, and fishing activities, to provide a familiar and meaningful context for students in the Riau Islands.

The product presentation format was chosen based on the characteristics of junior high school students who still enjoy elements of games and adventure. Kurniawan Setiawan, & Hidayat (2019) research supports the gradual unlock system for systematic learning, demonstrating that progressive unlock mechanisms can improve learning completeness.

During development, this learning media was created in Articulate Storyline 3. This software was chosen based on several technical advantages that support the realization of the designed concept. Articulate Storyline 3 has interactive features that support the integration of various media elements, flexible output, and ease of use without requiring complex coding (Rianto, 2020). This software can also create engaging interactive content and animations, and provides comprehensive features for producing 2D animations, multimedia content, and interactive

elements that enhance students' learning experiences. The effectiveness of Articulate Storyline 3 in educational media development has been demonstrated in Fahlevi & Yuliani's (2021) research, which showed a 78% increase in student engagement in interactive mathematics learning.

After the initial product was developed, it was validated by experts to ensure its quality prior to implementation. The media validation results showed an average score of 82%, meeting the criteria for "highly valid," in line with the media validation standards for learning materials established by Khamidah & Sholichah (2022), which set 80% as the threshold for the "highly valid" category. This high score was achieved due to several factors, including the design aspect, which scored 85% for successfully integrating elements of Malay maritime culture into a modern, attractive design. The research findings of Amelia, Rahmadani, Septiyani, Abdurrafi, & Maulidah (2025) show that the use of distinctive Malay colors such as gold, red, and green creates a strong and authentic visual identity, an approach proven effective in integrating local culture into digital learning media. Additionally, the user-friendly interface layout and intuitive navigation make it easy for learners to use the learning media. Consistency in design across every page also creates a harmonious and professional user experience. The strengths of this media are further enhanced by the application of an interactive adventure game format, which not only combines visual and local cultural elements but also actively encourages learners to explore and solve challenges step by step. This approach aligns with Rohma's (2025) findings, which indicate that educational games with gradual challenges and interactivity can enhance students' interest and motivation to learn. Appropriate difficulty levels challenge students to complete each level, directly increasing engagement and memory retention during the learning process.

The audio aspect received a score of 75% based on valid criteria, as it successfully integrated background music that aligned with the Malay maritime theme without disrupting learning concentration. The clear audio quality and balanced volume made the learning media comfortable to use, in line with the principles of educational audio design outlined by Sudianto, Hariri, & Wibowo (2023), which states that practical audio should support learning without becoming a distraction. However, this score is not as high as other aspects due to the limited variety of sound effects that could enhance the dramatic impact of the adventure. The adventure game aspect received a score of 80% for successfully creating an engaging gameplay flow with challenges appropriate for junior high school students. The implemented point-and-reward system effectively motivates students to complete each learning level, aligning with research by Suhendra, Rahman, & Juliah (2024), which emphasizes the importance of reward systems in enhancing learning motivation.

The material validation showed a higher average score of 85%, reflecting success in several important aspects. The alignment of the material with the curriculum and established learning outcomes makes this learning medium relevant to educational needs, who emphasize alignment with the curriculum as the main criterion for material validation. The depth of the material presented is appropriate for the cognitive level of junior high school students, neither too easy to be unchallenging nor too challenging to be frustrating. The contextualization of Malay maritime culture successfully links abstract mathematical concepts with concrete objects familiar to students in the Riau Islands, an approach also proven effective in Masamah's (2019) research on mathematics learning based on local culture. The systematic presentation of material, from simple to complex concepts, facilitates students' gradual understanding.

Language validation achieved a 90% score, indicating effective language use for learning. This high score was achieved due to several key factors, as stated by Daryanto (2013): the use of Indonesian in learning media must comply with EYD rules to serve as a good reference. The readability level of the language is

appropriate for the characteristics of junior high school students: not too formal so as to feel rigid and not too casual so as to remain educational. The clarity of instructions and usage guidelines facilitates students' navigation and interaction with the learning media. The consistent use of appropriate mathematical terms in accordance with curriculum standards also contributes to the high language validation score.

Based on positive validation results from experts, the learning media was then tested in class VIII.7 involving 35 students at SMP Negeri 1 Tanjungpinang to test the practicality and effectiveness of the learning media in real learning conditions. During the implementation stage, observation results showed that students actively participated and showed high enthusiasm when using the learning media. Furthermore, the results of the practicality questionnaire evaluation given to teachers and students also showed that the developed learning media provided a very high practicality value. This is because, first, in terms of usage, the features in the media are easy to use, as seen in the adventure guide; secondly, in terms of utilization, where it helps students understand the material, as stated by Pakudu (2024) that the presentation of interactive learning material, along with practice questions that allow students to evaluate their understanding independently, is complemented by a malay maritime cultural context that helps students connect the learning material with real-life situations.

The most important aspect is the effectiveness of learning media in improving students' mathematical problem-solving skills. The pretest and posttest results showed a significant increase from an average of 32.38 to 73.95, with an n-gain score of 0.61, placing it in the moderate category. According to Firdaus & Mahardika (2022), learning media is considered adequate when it meets at least the moderate or effective criteria in the n-gain test with a value of $0{,}3 \leq g \leq 0{,}7$. Therefore, it can be concluded that adventure game learning media with a maritime Malay cultural context can improve junior high school students' mathematical problem-solving skills.

At the evaluation stage, the overall learning impact showed that the adventure game learning media successfully met the established criteria. This learning media successfully increased students' motivation and understanding of flat-sided spatial figures through several effective mechanisms. The contextualization of Malay maritime culture helped students understand abstract mathematical concepts by relating them to concrete objects familiar in their daily lives. The reward system and adventure format implemented created an engaging and memorable learning experience. This is supported by research by Marhamah, Nuria, Anggraeni, Chotimah, & Palembang (2024), which found that the consistent application of rewards in learning can increase students' motivation, enthusiasm, and activity. Based on this, a similar finding was observed: students were motivated to complete each level and challenge because they felt engaged in an exciting adventure. The success of this educational media lies in its innovation, which combines three key elements: digital technology that enables high interactivity, gamification to enhance motivation, and local culture that provides contextual meaning.

Comprehensive validation by experts ensures that the learning media meet the required quality standards. The systematic ADDIE approach ensures that each stage of development is carried out carefully and purposefully. The focus on improving mathematical problem-solving skills has proven effective because the learning media have created a conducive environment for developing these skills.

The conclusion of this study shows that the adventure game learning media in the context of maritime Malay culture has been tested for validity, practicality, and effectiveness. Validity is supported by assessments from media experts (82%), material experts (85%), and language experts (90%), all of which show valid to very valid criteria. Practicality is demonstrated by the highly positive responses from students (88%)

and teachers (85%), indicating that the learning media is easy to use and valuable. Effectiveness is demonstrated by a significant increase in students' mathematical problem-solving abilities, with an n-gain score of 0.61, indicating effectiveness in the moderate to high category. Therefore, the product developed in the form of an adventure game learning media with the context of maritime Malay culture to improve mathematical problem-solving abilities in junior high school students is declared to meet the criteria of valid, practical, and effective, and is feasible to be used in mathematics learning at the junior high school level.

## IV. Conclusion

Research and development of adventure game learning media with a maritime Malay cultural context to improve junior high school students' mathematical problem-solving skills was conducted using the ADDIE model, comprising five stages: analysis, design, development, implementation, and evaluation. During the analysis stage, it was found that students had low mathematical problem-solving skills, with challenges including a lack of understanding of the material concepts and low motivation to work on problems involving mathematical problem-solving. Therefore, it is necessary to develop a learning medium that helps students understand the material's concepts while also providing challenges that motivate them to solve mathematical problem-solving questions. During the design phase, a product design was developed as an adventure game that incorporates subject-matter understanding presented through guided questions, mathematical problem-solving tips, and adventure challenges structured in a storyboard and prototype, including the context of Malay maritime culture and assessment instrument guidelines.

During the development stage, a product was created as an adventure game learning medium with a maritime Malay cultural context, and the product was assessed for feasibility by experts. The results of the expert assessment in terms of material, media, and language obtained an average score of 85.6%. During the implementation phase, practicality and effectiveness tests were conducted. The practicality test results were deemed highly practical, with an average score of 86.5%. In contrast, the effectiveness test results, measured using the Ngain score, yielded a value of 0.61, categorized as moderate.

The evaluation results show that the developed learning media have been tested for validity, practicality, and effectiveness. Thus, this study's output is a valid, practical, and effective game-based learning media with a maritime Malay cultural context to improve mathematical problem-solving skills among junior high school students.

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