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DEVELOPMENT OF GEOMETRY MOBILE LEARNING TO ENHANCE STUDENTS' MATHEMATICS LEARNING INTEREST

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ABSTRACT

The development research aims to produce a mobile learning application for geometry to enhance students' interest in learning mathematics. The product encompasses solid geometry materials for 7th-grade junior high school students. The development process follows the ADDIE model: Analyze, Design, Development, Implementation, and Evaluation. The product underwent testing with 7th-grade students at a junior high school in Yogyakarta. Data collection instruments included a questionnaire on students' interest in learning mathematics, a product validation sheet, teacher and student assessment sheets, and an observation sheet on the feasibility of the learning process. These instruments were utilized to measure the developed product's validity, effectiveness, and practicality. The research findings indicate that: (1) The developed mobile learning application for geometry is presented using Creative Problem Solving syntax, complemented with features such as live worksheets, Geogebra, instructional videos, Quizizz, and Google Forms, facilitating the enhancement of mathematical creativity. (2) The developed product is declared valid based on the validation results obtained from two media experts and two content experts, with an average Aiken index reaching 0.94 out of the maximum score of 1, categorizing it as "High." The product is assessed as practical based on teacher assessment at 96.55%, student assessment at 71.28%, and an average learning process implementation percentage of 85.83%. The product is also deemed effective due to a significant increase in the variable of students' interest in learning mathematics. Thus, the developed geometry mobile learning application meets the criteria of validity, practicality, and effectiveness.

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1. INTRODUCTION

The social shift in the 5.0 era is a continuation of the Industrial Revolution. The 4.0 era focuses on the rapid development of technology every day, where technology becomes crucial in various aspects of life nb. Technology is a design that creates products and enhances efficiency in all human activities. Gradually, technology is transforming lifestyles and mindsets, especially among teenagers, as discussed by Vidyastuti et al. [1], [2], particularly in its use as a learning resource that can increase students' interest in learning [3], [4], [5].

Interest plays a crucial role in learning mathematics [6]. Students who are interested in learning can utilize higher cognitive processes to study, learn, and master the presented material [7]. They strive to understand the material, improve their performance, seek challenges, and continue tasks even when they face difficulties [8]. One of the factors influencing students' interest in learning mathematics is the use of learning media [9], [10], [13], [14]. The use of interesting learning media increases students' interest in learning [13], [14], [15] and encourages them to successfully comprehend the material [16]. Many students still face challenges in understanding presented material, which is inefficient because textbooks are the only means used, and students have to spend a significant amount of money to obtain them. One of the media that can help increase students' interest in learning is by using social media [5], [17].

To address the issue of low mathematical learning interest, one effort is to use interactive instructional media that can be employed in mathematics learning to capture students' interest and motivation in the learning process. The development of instructional media used in this study is based on the ADDIE development model developed by Branch. According to the ADDIE model, the development of a product must go through five systematic phases [18], which are Analysis, Design, Development, Implementation, and Evaluation. Mobile learning is an engaging and effective instructional media to address issues in mathematics learning. Nugroho [19] explains that Mobile Learning is learning through wireless technology devices that can be utilized anywhere, and it can help individuals instantly access learning at their fingertips. According to Mehdipour [20], mobile learning has features and functions to support students. In other words, mobile learning is learning that utilizes mobile devices as a learning medium that can be conducted anywhere and anytime, making the learning process effective.

Mobile learning is one alternative for developing instructional media. By incorporating game elements into instructional media, students will be more interested and active in participating in the learning process. This is explained by Novaliendry [21] that Educational Games are games accompanied by learning and are expected to enhance understanding quickly due to the engaging nature of the game, making students active. This aligns with Wibisono [22], stating that Games are essential for brain development, improving concentration, and training to solve problems accurately and quickly because games involve various conflicts or problems that require quick and precise solutions. Instructional media is a method used to convey material in the teaching and learning process.

Based on Nugroho's research [23], the use of Mobile Learning Games can increase students' interest in mathematics by 20.57% and improve mathematics learning outcomes by 10.86%. Another study conducted by Supandi et al. suggests that learning using mobile applications has a positive impact on student achievement. According to post-test and pretest data and questionnaires given to students, there was an improvement in test results and students' attitudes towards mathematics learning. From the above research, it can be concluded that learning using mobile learning-based instructional media plays a crucial role in education and is effective in learning. Based on the above facts, it is evident that the use of mobile learning geometry applications in mathematics learning, especially geometry, will greatly aid the learning process and enhance the performance of educators. The appropriate use of learning media can assist teachers in delivering the material being taught more comprehensibly, and it enhances uniformity in students' understanding of the material. These aspects form the essential foundation for conducting this research, aiming to develop a mobile learning geometry application to improve students' interest in learning mathematics.

2. RESEARCH METHODS

The population for this study consists of seventh-grade students in junior high school. The research conducted is a Research and Development (R&D) utilizing the ADDIE model, encompassing the Analysis, Design, Development, Implementation, and Evaluation stages. The Analysis stage includes curriculum, student, situation, and technology analysis. The Design stage involves designing instructional media, developing materials, sample questions, practice questions, a media validation questionnaire, and a questionnaire on students' interest in mathematics. The Development stage encompasses the creation of a product, wherein the developed product is a mobile learning application built using the Flutter framework. Flutter is an open-source application framework created by Google, allowing anyone to build mobile applications [https://Flutter.dev/]. In the Implementation stage, the instructional media, declared valid, is further tested in the classroom. During the Evaluation stage, the researcher conducts a final test in the form of a posttest during the last meeting to determine students' interest in learning after implementing the mobile learning geometry instructional media.

The evaluation of this product will consider three aspects: validity, practicality, and effectiveness. Validity assessment instruments include a media validation questionnaire and a material validation questionnaire. Practicality is assessed using a student response questionnaire, while effectiveness is evaluated using a questionnaire on students' interest in.

2.1 Analysis of Validity

In the validity analysis, data tabulation was performed by validators, specifically the material validator and the media validator. Data tabulation involved assessing various aspects by assigning scores provided as follows: Excellent (score 5), Good (score 4), Fair (score 3), Poor (score 2), and Unsatisfactory (score 1). The calculation of the validity index was conducted using the Aiken method, employing the formula established by Aiken [24].

$$V = \sum \frac{s}{[n(c-1)]} \tag{1}$$

Explanation:
V : Agreement index among raters regarding the validity of items
s : Score of each rater minus the lowest score
n : Number of raters
c : Number of categories that raters can assess

Based on the aforementioned formula, V represents the agreement index of raters regarding the relevance of items (or the appropriateness of items) with the intended indicator to be measured using those items. Once the validity index is obtained, the validity of the instructional tool can be categorized. The criteria for the agreement index of media and material validity are presented in Table 1 below.

Table 1. Criteria for the Agreement Index of Media and Material Validity

No	Agreement Index Score	Criteria
1	$0.8 \leq V \leq 1$	High
2	$0.4 \leq V < 0.8$	Moderate
3	$V < 0.4$	Low

According to Table 1, the obtained agreement index is less than 0.4, then its validity is considered low. If the obtained value falls between 0.4 and 0.8, its validity is deemed moderate, and if the value exceeds 0.8, its validity is considered high. When the rater's agreement index is below 0.4, its validity is deemed low; between 0.4-0.8, it is considered moderate, and if it exceeds 0.8, it is classified as high [24]. Based on these criteria, a developed product is considered valid if it meets the high criteria.

2.2 Analysis of Practicality

The practicality analysis aims to determine whether the developed Molge application meets practical criteria. Data on the practicality of the Molge application are obtained from observation sheets of learning implementation, teacher assessment sheets, and student assessment sheets on the implementation of learning. To analyze the practicality data of the Molge application obtained from teacher and student assessments, the following steps are taken.

a) Summarizing the practicality assessment scores by teachers and students.
b) Calculating the percentage of practicality assessment results from teachers and students using the following formula.

$$p = \frac{\sum x_i}{\sum x} X\ 100\% \quad (2)$$

Where:
p : percentage assessment
$\sum x_i$: Total subject responses
$\sum x$: Total highest scores

c) Analyzing the practicality of the product based on the percentage of practicality assessment results from teachers and students, following the product practicality criteria as outlined in **Table 2.**

Table 2. Practicality Criteria

Achievement Level	Criteria
85.01%-100%	Very Practical
70.01%-85.00%	Practical
50.01%-70.00%	Less Practical
0%-50.00%	Not Praktical

(Adapted from Akbar [25])

According to **Table 2**, a mobile learning geometry application is considered practical if it achieves a minimum percentage of 70.01% or falls within the Practical criteria. Therefore, the product can be categorized as practical and suitable for use as a mathematics learning tool. Furthermore, for the practicality of the product based on the percentage of learning activity implementation, the mobile learning geometry application is deemed practical and suitable for use as a mathematics learning tool if the percentage of learning activity implementation exceeds 80%.

2.3 The Analysis of Effectiveness

Effective instructional media is characterized by the difference in pretest and posttest results in the tested class. The analysis of the effectiveness data is conducted in two stages, namely, the analysis of initial data and final data. The test employed to assess the effectiveness of this product is the paired sample t-test.

3. RESULTS AND DISCUSSION

The mobile learning geometry application developed in this research aims to facilitate students in learning mathematics, particularly on the topic of spatial structures. In this study, the specific subjects taught are spatial nets, surface area, and volume of three-dimensional shapes. The content of the application is tailored to the Merdeka curriculum. The delivery process of the mobile learning geometry application adopts the Creative Problem-Solving approach. The steps of creative problem solving are as follows: Understanding the Challenge, Generating Ideas, Preparing for Action, and Planning Approach.

The development of the mobile learning geometry application in this research has been conducted in accordance with the ADDIE stages, namely analysis, design, development, implementation, and evaluation. Nieveen [28] asserts that a quality development product is one that meets the criteria of validity, practicality, and effectiveness. Therefore, based on expert validation results and field trials, it is known that the developed mobile learning application meets the criteria of being valid, practical, and effective, particularly in terms of students' interest in learning mathematics. The following is a description of the logo of the developed mobile learning geometry application.

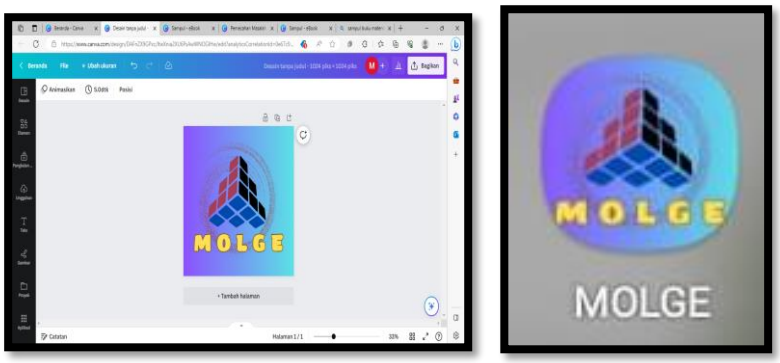

Figure 1. Logo Display of Molge

The creation of the Molge application logo was assisted using the Canva application. The Molge logo, as depicted in **Figure 1**, was designed by incorporating an image with three sides of different colors, symbolizing that the application encompasses materials related to three-dimensional geometric shapes. Additionally, it includes the inscription "Molge," which is the name of the developed application.

The developed mobile learning application is equipped with learning menus that facilitate students in using the geometry mobile learning application. The following provides an overview of the menus in the mobile learning application.

(a) (b) (c) (d)

(e) (f) (g) (h)

Figure 2. Display of Geometry Mobile Learning Application Menus: (a) Application Home Display, (b) Home Menu, (c) Introduction, (d) Instruction Menu, (e) Concept Map Menu, (f) Material Menu, (g) Questionnaire Menu, (h) Bibliography Menu.

This application begins with a visual display featuring the UNY logo, application name, class, a start button to access the menu section, researcher's name, faculty, and university name. The initial interface of the Molge application is presented in **Figure 2** (a). The home menu in **Figure 2** (b) is the view after clicking the start button on the initial interface of the Molge application. Therefore, the design and content of the home menu should be comprehensive, user-friendly, and attention-grabbing for Molge application users. The menus available in this section include the concept map menu, application characters menu, usage instructions menu, lesson plan menu, concept map menu, learning material menu, questionnaire menu, bibliography menu, and developer profile menu. The introductory text menu in **Figure 2** (c) contains opening statements by the developer, expressing gratitude, providing an overview, expressing hopes, and giving thanks. The user guide menu in **Figure 2** (d) contains the flow or instructions on how students can use the Molge application.

The concept map provides a general overview of the material that students will learn hierarchically. Its purpose is to make it easier for students to remember the main concepts that will be learned in the geometry material. The concept map's appearance is presented in **Figure 2** (e). In the material menu in **Figure 2** (f), it contains the geometry material studied during this research, instructional videos, links to liveworksheets for interactive worksheets, quizizz links for quizzes, and geogebra links. When the questionnaire menu button is clicked, the page will redirect to https://docs.google.com/forms/, where this form contains questionnaires for educators and students. The appearance of the educator response questionnaire, interest questionnaire, and student response questionnaire is presented in **Figure 2** (g). The bibliography menu is presented in **Figure 2** (h), consists of three parts: bibliography, glossary, and a collection of formulas.

The instructional media in the form of the developed mobile learning geometry application aims to enhance the mathematical creativity of Grade VII students in the topic of spatial structures. The developed geometry mobile learning application follows the Creative Problem Solving (CPS) steps, namely understanding the problem, generating ideas, and preparing actions. The application is equipped with features like liveworksheets, Geogebra, instructional videos, Google Forms, and Quizizz, allowing students to review lessons they may not have understood whenever and wherever they want. The application can be accessed through Android-based smartphones or tablets connected to the internet. The Student Worksheets (LKS) in the mobile learning geometry application are presented using liveworksheets. With liveworksheets, the appearance of LKS becomes engaging and interactive, as if students are playing a game. The question formats include multiple-choice with drop-down options, checkboxes, matching by drawing lines, drag-and-drop questions, creating productive questions, open-ended questions, and other formats as needed. The use of liveworksheets as LKS with CPS steps facilitates students in creative thinking. The geometry topics in the mobile learning geometry application are presented using instructional videos. The selected instructional videos consider their attractiveness, relevance to the taught material, and ease of student comprehension, supporting the enhancement of mathematical creativity.

In addition to videos, spatial structures material is also presented with the assistance of Geogebra. Geogebra in the mobile learning geometry application is used to help students understand given problems, demonstrate the properties of spatial structures, and facilitate creative and interactive thinking in learning. The geometry mobile learning application is also equipped with Quizizz features used to create quizzes for student assessments with various question formats. The quizzes have time limits for each question, and the student who answers correctly and the fastest receives the highest score for that question. The overall results are used to determine the students with the highest scores, displayed at the end of the quiz game for the top three students. This competitive element encourages students and creates a challenging environment for learning mathematics. Moreover, the use of Quizizz in this application assists teachers in evaluation without being constrained by location, providing an attractive display and timed settings to guide concentration. The mobile learning geometry application includes a questionnaire menu using Google Forms, making it easy for researchers or teachers to collect data and simplify the analysis of student learning outcomes.

3.1 The Validity of Mobile Learning Application

Based on the assessments conducted by experts, the final product of the geometry mobile learning application for spatial structures material based on Creative Problem Solving consists of product validation from the media aspect and product validation from the material aspect. The geometry mobile learning application and other developed instruments were validated by two experts. The validation aims to

determine the feasibility of the developed product and instruments [24]. Based on the results of the validation of the geometry mobile learning application by media and material experts, the Aiken index for the feasibility of the geometry mobile learning application from the media aspect is 0.94 with a high category, and the Aiken index for the feasibility of the geometry mobile learning application from the material aspect is 0.875 with a high category.

According to expert assessments, the geometry mobile learning application has met the validity criteria after revisions based on suggestions and input from validators. Therefore, the geometry mobile learning application and the developed instruments are deemed suitable for use in research. This aligns with the statement that a developed product is considered valid when the media and instruments can measure what they are supposed to measure. Furthermore, Akker et al. [26] state that a developed product can be deemed valid if it is based on a strong rational theory and there is internal consistency among each component in the developed product.

Based on the obtained results, it can be concluded that the developed product and instruments meet the aspects of validity and are suitable for use in classroom learning. The geometry mobile learning application has proven to be valid and demonstrates that the developed application aligns with the theory and development of mathematics learning media [26].

3.2 Practicality of Mobile Learning Application

The practicality criteria are used to determine the ease and attractiveness of the developed learning media, namely the Geometry Mobile Learning application. Practicality assessments were obtained from the questionnaires filled out by two mathematics teachers and 32 seventh-grade students as research subjects. Practicality data were collected from both teachers and students during the research. In its practical use, the Geometry Mobile Learning application was found to be quite conducive for students, although there were initial challenges related to adapting to the application. The following is the summary of the practicality assessment of the Geometry Mobile Learning application by teachers presented in Table 3.

Table 3. Teacher Response Results

	Assessment Score	
	Teacher 1	Teacher 2
Total score	138	141
Maximum Score	139.5	
Percentage	96.55%	
Practically Category	**Very Practical**	

Based on the information from Table 3, the assessment of the practicality of the Molge application by two educators indicates a percentage rating of 96.55%, falling within the category of highly practical. Consequently, it can be concluded that the developed Molge application fulfills the practicality aspect. A more detailed overview of the practicality assessment by educators can be found in the appendix.

Table 4. Student Response Results

	Assessment Score
Number of Students	32
Total Score	2395
Percentage	71.28%
Practically Category	**Practical**

Based on the practicality assessment results in Table 4, the average score indicates a figure of 71.28%. According to the classification in Table 21, falling within the range of 66.67%-80.00%, the practicality assessment of the Molge application by students is deemed "practical" for use in learning. For a more detailed breakdown of the practicality assessment by students, please refer to the appendix.

Based on the results obtained, there is a significant difference between the practicality assessment results by teachers and students. The practicality assessment by teachers falls into the "very practical"

classification, which is due to the content presented in the Geometry Mobile Learning application being in line with the learning achievements and objectives of the seventh-grade spatial structure curriculum. According to teachers' comments, the application is user-friendly, visually appealing, and the selected colors are not distracting. On the other hand, the practicality assessment by students falls into the "practical" classification and does not reach the "very practical" classification, differing from the teachers' assessment. This is attributed to the relatively short duration of the research, as it clashed with teacher meetings, Grade IX National Exams, the Merdeka curriculum project, and end-of-year assessments, resulting in suboptimal implementation of the Molge application. Therefore, when using the Geometry Mobile Learning application in teaching, attention should be paid to the timing of implementation. However, despite this, the application's usage, based on the practicality assessment by students, meets the practicality criteria established in this research. Thus, it can be concluded that the developed learning media falls into the practical category. Han and Shin [27] revealed that students using mobile learning for geometry in their learning process experienced a significant improvement based on the conducted tests. Learning through technology allows for more meaningful learning, enabling students to better understand concepts. Based on the above research results, mathematics learning using the Geometry Mobile Learning application falls into the practical category for use.

3.3 Effectiveness of Mobile Learning Application

The questionnaire results on students' learning interests are considered effective if a minimum of 70% of students in the class have achieved at least a "Good" category and students' learning interest has increased. A concise analysis of the students' learning interest data is presented in **Table 5.**

Table 5. Student Learning Interest Questionnaire Results

Score Interval	Category	*Pretest*		*Posttest*	
		Freq	%	Freq	%
$84 < X \leq 100$	Very Good	0	0	4	12.50
$68 < X \leq 84$	Good	19	59.38	28	87.50
$52 < X \leq 68$	Fairly Good	13	40.63	0	0
$36 < X \leq 52$	Less Good	0	0	0	0
$X \leq 36$	Not Good	0	0	0	0

Based on **Table 5** it can be observed that initially, before the learning was given, some students had good learning interest, and some had fairly good learning interest. However, there were no students falling into the categories of very good, less good, or not good. After the learning using the Molge application, students in the fairly good category significantly decreased. The table shows that after the learning, 100% of students have learning interest in at least the good category. This indicates that the use of the Molge application can improve students' learning interest. Next, the results of testing the students' learning interests questionnaire data are as follows.

Normality Test

Before hypothesis testing, an assumption test is conducted, which is the normality test of students' learning interest. This test is done using SPSS Statistics 25 with the Shapiro-Wilk test. The normal distribution of data is assumed if the significance value is $\propto > 0.05$ (5%), indicating that H_0 is accepted, and the data is considered normally distributed with the hypothesis:

H_0 : data is from a normally distributed population
H_1 : data is from a non-normally distributed population.

The results of the normality test for pretest and posttest students' learning interest can be seen in **Table 6**.

Table 6. Normality Test Results for Student Learning Interest

Statistic	*Pretest*	*Posttest*
Df	32	32
Sig. (2-tailed)	0.299	0.106
Taraf Signifikansi ($\propto$)	0.05	0.05
Conclusion	**Data is normally distributed**	**Data is normally distributed**

Based on **Table 6,** the Shapiro-Wilk significance values for pretest and posttest are 0.299 and 0.106, respectively, indicating that both pretest and posttest values are normally distributed. In other words, the students' learning interest questionnaire data meet the assumption of normality. Since the data is normally distributed, hypothesis testing is then performed as follows.

Hypothesis Testing

There are two forms of statistical tests used for hypothesis testing, as follows. Test 1 will examine whether the mean posttest score of students' learning interest is greater than the mean pretest score of students' learning interest. The hypothesis test uses the paired sample t-test with the help of SPSS. The hypotheses are:

$H_0: \mu_b \leq \mu_a$ the mean posttest score of students' learning interest is less than or equal to the mean pretest score of students' learning interest

$H_1: \mu_b > \mu_a$ the mean posttest score of students' learning interest is greater than the mean pretest score of students' learning interest

The results of the paired sample t-test output are summarized in **Table 7.**

Table 7. Paired Sample T-Test of Students' Mathematics Learning Interest

	Paired Differences			*t*	**Df**	**Sig. (2- tailed)**
	Mean	***Std. Deviation***	***Std. Error***			
Pair 1 Pre- Post	9.78	8.58	1.52	6.44	31	.000

H_0 is rejected if $t > 0$ dan $\frac{sig.(2-tailed)}{2} < 0.05$

Based on **Table 7** it can be seen that t is positive $6.44 > 0$ and the value $\frac{sig.(2-tailed)}{2}$ is .000 which is below 0,05 therefore $H_0$is rejected. Its mean posttest score of students' learning interest is greater than the mean pretest score of students' learning interest. This suggests an improvement from the pretest (before treatment) to the posttest (after treatment).

After Test 1, Test 2 is conducted. This test aims to determine whether the proportion of students who obtain a posttest score of students' learning interest reaching the "Good" minimum criteria is more than 69.9%. The hypotheses are:

$H_0: \pi \leq 69{,}9\%$ The proportion of students achieving a minimum "Good" category is less than or equal to 69.9%

$H_1: \pi > 69{,}9\%$ The proportion of students achieving a minimum "Good" category is greater than 69.9%

with a significance level $\propto = 0.05$. The test statistic (Z) was calculated using the formula:

$$Z = \frac{x - np_0}{\sqrt{np_0 q_0}}, dimana\ q_0 = 1 - p_0 \qquad (3)$$

where:

$x = 32$

$p_0 = 0.69$

$q_0 = 1 - 0.69 = 0.31$

$n = 32$

$$Z = \frac{32 - 32.0.69}{\sqrt{(32)(0.69)(0.31)}} \qquad (4)$$

$$Z = 3.79 \qquad (5)$$

Substituting the values, the calculated $Z = 3.79$ and $Z_{0.05} = 1.645$. Since $Z > Z_{\propto}$, H_0 is rejected. Therefore, it can be concluded that the proportion of students achieving at least a "Good" category in the posttest scores of student learning interest is greater than 69.9%. The results indicate

that the development of the Molge application for solid geometry is effective in terms of students' learning interests.

Although the percentage difference before and after the learning is not substantial, there is an improvement in each indicator. The slight increase may be attributed to the relatively short implementation of the Molge application in the seventh-grade SMP class. Mathematics classes are often the last period and may be interrupted by various activities, such as school cleaning before the final exams of the ninth-grade or before holidays. This factor could contribute to the suboptimal implementation of the Molge application.

However, during the instructional sessions, students utilizing the Molge application exhibited increased enthusiasm, motivation, and active participation. This heightened engagement can be attributed to the diverse features integrated into the Molge application, including Liveworksheets (LKS), Geogebra, instructional videos, Google Forms, and quizzes. Khikmiyah and Aisyiyah Rakhma D [28] in their research, asserted that the utilization of Liveworksheets (LKPD) enhances activity levels and improves mathematics learning outcomes, particularly in the context of online learning. Furthermore, Lestari [29] emphasized that the presentation of instructional videos with audio supports the development of creative thinking skills in students when studying solid geometry. This approach is extended through group discussions to identify suitable strategies for problem-solving. Additionally, Partayasa concluded that the use of video-assisted learning enhances students' interest in learning mathematics. This statement aligns with the notion that the presentation of instructional videos within the Molge application supports and enhances students' mathematical creativity and learning interest.

Setiyani [30], in her research, concluded that mathematics learning, assisted by Geogebra, contributes to an increase in students' mathematical creativity. Partayasa, in another conclusion, highlighted that the utilization of the Creative Problem Solving (CPS) model, supported by instructional videos, leads to an increased interest in learning among students. The combination of instructional videos and GeoGebra provides students with a unique learning experience through the use of multimedia learning tools. The integration of these two learning media creates dynamic visualizations that are both captivating and make the learning of mathematics, especially solid geometry, more enjoyable, consequently enhancing students' interest.

Furthermore, Nurwijaya [31] stated that the learning process using the Quizizz application encourages students to be more active and motivated as they engage in educational games while learning. This perspective is consistent with Purba [32] assertion that Quizizz is described as an educational application based on gaming principles, introducing multiplayer games into the classroom, making exercises enjoyable and interactive. Enjoyable and interactive learning supports creative thinking and fosters students' interest in learning mathematics.

Based on the presented findings, it can be concluded that the features embedded in the Molge application effectively support and enhance students' learning interest. Therefore, the utilization of the Molge application in this study yielded positive results, with students' learning interest experiencing an increase and falling into the "Good" category. In addition to the features provided within the application, the content and instructional steps packaged within the Creative Problem Solving (CPS) model are identified as key factors contributing to the increased learning interest observed in this study.

According to Pepkin [33], the CPS model is an instructional framework that focuses on teaching and honing problem-solving skills, followed by reinforcing these skills and creatively structuring solutions. This is substantiated by Ginting's research, which asserts that the utilization of the CPS model influences students' creative thinking abilities, particularly in the context of quadrilaterals. The evidence from the research indicates that classes employing the CPS model achieve higher average scores compared to those not using this instructional model. Additionally, Malisa posited that the advantage of the CPS instructional model lies in training students to design discoveries, prompting active engagement, and focusing students' attention due to their curiosity about solutions to the problems presented. The attention and activity demonstrated by students during discussions indicate a heightened interest in participating in mathematics classes.

In summary, based on the aforementioned descriptions, it can be inferred that the Molge application, designed for the solid geometry topic, serves as an effective instructional tool that has

undergone rigorous validation for its validity, practicality, and effectiveness. Therefore, the development of the Molge application is deemed suitable for integration into educational activities.

4. CONCLUSIONS

The findings from the developed research and subsequent analyses lead to conclusions regarding the developed mobile learning geometry application. The conclusions are as follows: (1) The characteristics of the mobile learning geometry application aim to enhance mathematical creativity, focusing on solid geometry topics. The content includes features such as instructional videos, liveworksheets, Google Forms, and GeoGebra. The instructional materials in the mobile learning geometry application are packaged in instructional videos and liveworksheets, supplemented with Creative Problem Solving (CPS) syntax. Liveworksheets serve as instructional tools for studying solid geometry, GeoGebra assists in drawing and analyzing spatial structures, and Quizizz provides practice questions. (2) The mobile learning geometry application for enhancing creativity demonstrates the following qualities: (a) The application is deemed valid based on validation results by media and subject matter experts. (b) The application meets practicality criteria based on teacher assessments, student evaluations, and observations of learning implementation. (c) The mobile learning geometry application effectively enhances mathematical creativity. Paired sample t-test results show that the average posttest scores exceed the average pretest scores of student learning interest, indicating a significant improvement before and after learning with the mobile learning geometry application. Furthermore, proportion tests indicate that students' scores in mathematics learning interest meet the criteria for "good," exceeding 69.9%.

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