INTEGRATION OF CHARACTER EDUCATION IN ANDROID-BASED M-LEARNING MEDIA ON PROBLEM-SOLVING ABILITY

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Abstrak

Tujuan penelitian ini untuk menghasilkan media *M-learning* yang efektif, praktis, efektif dengan memasukkan pendidikan karakter dan kemamampuan pemecahan masalah dalam media pada materi kubus dan balok. Penelitian ini mengadopsi model desain pengembangan ADDIE yang meliputi lima tahapan utama yaitu analisis, desain, pengembangan, implementasi dan evaluasi. Subyek penelitian ini adalah siswa kelas VIII SMP Negeri 10 Sungai Kakap yang berjumlah 15 siswa. Instrumen yang digunakan adalah lembar validasi, angket, dan soal pretest dan posttest. Teknik analisis data yang digunakan adalah statistik diskriptif. Hasil penelitian menunjukkan rata-rata persentase hasil validasi media *mobile learning* oleh ketiga ahli adalah 85,56%, memenuhi kriteria sangat valid. Skor kumulatif angket guru dan siswa mencapai 88,66%, sangat praktis. Hasil uji statistik inferensial dari pretest dan posttest dengan menggunakan uji t, diperoleh bahwa $t_{hitung} < -t_{tabel}$ dengan signifikan $\alpha = 5\%$ yang artinya terdapat perbedaan yang signifikan kemampuan pemecahan masalah antara sebelum dan sesudah menggunakan media mobile learning sehingga dapat dikatakan bahwa media tergolong efektif. Oleh karena itu, dapat disimpulkan bahwa pengggunaan media *mobile learning* yang dipadukan dengan pendidikan karakter terhadap kemampuan pemecahan masalah tergolong valid, praktis dan efektif.

Katakunci: *M-learning*, Pendidikan Karakter, Kemampuan Pemecahan Masalah

Abstract

The purpose of this study is to produce effective, practical, effective M-learning media by incorporating character education and problem-solving abilities in media on cubes and blocks. This study adopts the ADDIE development design: analysis, design, development, implementation and evaluation. The subjects of this study were 15 students of class VIII SMP Negeri 10 Sungai Kakap. The instruments used were validation sheets, questionnaires, and pretest and posttest questions. The data analysis technique used was descriptive statistics. The results showed that the average percentage of validation results of mobile learning media by the three experts was 85.56%, fulfilling the very valid criteria. The cumulative score of the teacher and student questionnaire reached 88.66%, very practical. The results of the inferential statistical test from the pretest and posttest using the t-test, it was found that $t_{count} < -t_{table}$ with a significant $\alpha = 5\%$, which means that there is a significant difference in problem-solving abilities between before and after using mobile learning media so that it can be said that the media is classified as effective. Therefore, it can be concluded that the use of mobile learning media combined with character education on problem-solving abilities is classified as valid, practical, and effective.

Keywords: M-learning, Character Education, Problem-Solving Ability

INTRODUCTION

One of the objectives of learning mathematics in the 2013 curriculum form students' ability to solve mathematical problems and develop character according to mathematical values (Permendikbud, 2018). Problem solving ability is a competency that must be possessed by students in learning mathematics (Hanifah & Nuraeni, 2020; Latifah & Luritawaty, 2020). Problem-solving abilities are important for students to master because having good problem-solving skills will also improve their learning achievement (Hodiyanto, 2017). The success of students in the learning process can be seen from their understanding of the concept being studied and students' problem-solving abilities by mastering and understanding the material, the students understanding it will make easier for solving mathematical problems. The results showed that students were still weak in solving questions related to problem-solving abilities (Bruun & Pearce, 2013; Hodiyanto et al., 2020; Salemeh & Etchells, 2016).

Based on the results of an interview with one of the mathematics teachers at SMP Negeri 10 Sungai Kakap, it was found that students' problem-solving abilities were still relatively low. Furthermore, the researcher conducted pre-research by giving tests to students to analyze problem-solving abilities which were given in the form of word problems on the surface area of cubes and blocks. This analysis is based on problem-solving steps according to Polya (Zakiah et al., 2019): (1) understanding the problem; students need to first identify the data in the problem; (2) make plans; students associate existing knowledge with data and what is asked in the problem; (3) carry out the plan; Next, students do calculations/computations; and (4) checking again; Students try to answer the question in different ways. The answers given by these students can be seen in Figure 1 as follows:

Figure 1. Student Answers to Problem-Solving Questions

From Figure 1, it can be seen that there are two answers to the questions given. On the first question, the student did not include what data was known and what was asked in the question. The formula used to solve the problem is correct, but the student does not present the sequence of solving steps in an unclear way. Students also do not check again. Re-checking is used to check again if there

are deficiencies or errors in the answers that have been done. Furthermore, for the second question, the students also did not include what data was known and what was asked in the problem. The formula used in solving the problem is correct, but wrong in placing the order of the completion steps. Even though the final answer is correct, the student does not present the sequence of completion steps correctly and does not draw conclusions from the answers, and does not re-check the answers. Based on this, students have not implemented good problem-solving strategies.

The results of interviews with teachers showed that one of the reasons for the low level of learning was that so far it had not varied, coupled with the Covid-19 period, which made it difficult for teachers to design effective learning. The media so far has only used pdfs, simple PowerPoint, and photos sent to WhatsApp. Therefore, one way to help students overcome this problem is to design instructional media that can be accessed easily by students and of course, the media developed must be adapted to the student's educational level. The use of appropriate media in the learning process can help students visualize abstract mathematical concepts, which can stimulate students' interest in learning and stimulate their interest in learning (Saputra & Permata, 2018). One of the learning media that can be developed is learning media that utilizes smartphone technology or commonly known as M-learning (Saputra & Permata, 2018), so that M-learning can be accessed on Android or smartphones. Thus, this learning media has become an alternative during Covid-19. The results of the researcher's research show that Macromedia flash contains problem posing can improve problem-solving abilities (Hodiyanto et al., 2020). Android-based media with contextual content is classified as valid, practical, and effective in improving mathematical problem-solving abilities (Yani et al., 2021). Mobile learning media containing characters, and based on Android is classified as valid, practical, and effective (Yani et al., 2022). Therefore, the researcher tries to continue this research by designing other interactive learning media to develop problem solving abilities, but can be accessed by Android because previous research can only be used on laptops.

M-learning is learning that can be done anywhere, anyone, and anytime and makes it easy for students to gain knowledge (Huda et al., 2019). The involvement of Android-based M-learning helps educators in learning by providing opportunities for students to relearn existing material wherever and whenever without attachment. This of course can be an alternative for teachers in delivering material to students. In addition, the android-based M-learning media in this study will be integrated with character education

Character education is very important to instill in students to form students who have good morals and behavior. Character education itself can be started with school education. However, the results of the researchers' research show that in the implementation of instilling character values in schools there are still obstacles, one of which is the very limited time provided for the learning process (Darma et al., 2018). Time limitations are a problem in implementing character values at school, therefore a way is needed to minimize this problem, namely by integrating these character values into learning media. By integrating character values into learning media, it is hoped that can help educators in instilling character values in students as a provision for students to face the future so they are not swayed by the magnitude of the impact of globalization. Thus, this research is one of the follow-up studies by Darma et al. (2018) which has been done by previous research.

The results of research by Syamsuar & Reflianto (2018) show that the more rapid the development of technology, the more complacent students will be, the more they will have an irresponsible attitude, the morality will decrease and the crime among students will increase. This is due to the lack of cultivation of character education and is a challenge for educators, namely, they must strengthen the moral character of students so they are not trapped in the rapid development of technology. Given this, the use of technology must be balanced with the cultivation of character values that can be applied in school education, the cultivation of character values that can educate and prevent students from bad behavior. Therefore, the need for character education content in the developed media.

METHOD

The research design used is the ADDIE development model, a development model consisting of five stages: analysis, design, development, implementation, and evaluation (Sugiyono, 2015).

Analysis

The stages of analysis include: (1) needs analysis, this stage is carried out to analyze learning media as the main information in learning and the availability of media that supports the implementation of a lesson. At this stage, the development of learning media is determined to help students. (2) identification of problems, problem identification is done to study the problems faced by students during learning. Problem identification is carried out to obtain information such as student characteristics, and problems encountered during learning, and determine the material to be taken. (3) task analysis, task analysis is carried out to identify solutions to problems faced by students that have been found previously. At this stage, a solution is determined for the problems that occur.

Design

At the design stage, the formulation of the problem is carried out in a specific and realistic manner according to the analysis carried out previously. Then consider the sources of relevant learning materials by those used in schools. At this stage, the instruments to be used in the research were also prepared

Development

Development is the process of realizing the detailed design into the form of the selected media. This step is followed by validating the product and revising it based on the results of suggestions and input provided by the validator and will be taken into consideration for evaluation before being applied to schools. The goals that need to be achieved at this stage are to produce, validate, and revise the media that is made. This is done to get the best product that will be used to achieve learning objectives.

Implementation

After the product is declared valid, the product will then be tested on students of SMP Negeri 10 Sungai Kakap. In this stage, the products that have been developed are arranged according to the functions and objectives to be obtained by the researcher. The implementation aims to guide students to achieve competencies in the material, to be able to overcome problems that exist in students according to the goals of the researchers and to cultivate the skills and attitudes of students that have been determined by researchers. In addition, researchers also provide questionnaires to students who aim to find out the opinions of students related to the media that researchers develop. Opinions and reason of students will be considered and do not rule out the possibility of being revised according to students' responses.

Evaluation

Evaluation of the product is carried out at each development stage by researchers, supervisors, and validators, making suggestions for improvements to make the product under development even better. Assessments are also conducted by students and teachers via questionnaires they fill out, bearing in mind previous verifiers' recommendations for applied learning media. The data collection tools used are: (1) The validation sheets were for media validity. (2) Questionnaire of students and teachers on the media. The student questionnaire was to see media practicality. (3) The problem-solving ability tests. The tests were to see media effectiveness. Data analysis techniques performed in this study used descriptive and inferential statistics. Validity and practicality will be analyzed by the formula: index percentage $= \frac{\text{Total score obtained}}{\text{Maximum Score}} \times 100\%$. If the validation and response indexes reach the criteria above 61% then the media is valid and practical (Widyoko in Indrayanti, 2016). The effectiveness of the media can be seen from the difference in problem-solving abilities before and after being given the media. For this reason, the t-test was conducted to test for these differences.

RESULTS AND DISCUSSION

RESULTS

Analysis

The analysis phase is carried out by analyzing needs, identifying needs, and identifying tasks. The analysis was carried out by interviewing teachers and pre-research conducted at schools. The results of the analysis can be described as follows: (1) Needs Analysis, needs analysis is related to the search for information related to the media being developed. The teacher still uses very few media let alone develop learning media and the teacher only uses student worksheets that are usually bought at bookstores. Even though the school has implemented the 2013 curriculum (K13) of course teachers are expected to be able to utilize technology in learning and be able to develop technology-based learning media. (2) Identification of problems, the use of technology is needed in the learning process to achieve the learning objectives properly. Based on the results of interviews, almost all students have smartphones, during the pandemic, smartphone use was only used as a medium of communication between teachers and students. In this case, researchers developed a learning media that utilizes smartphone technology, namely M-learning. Utilization of smartphones as learning media to support learning activities to achieve learning objectives. Another problem faced by students is the ability to solve problems, especially in the form of stories. Based on the results of pre-research conducted through a sample of class VIII students. Students tend to find it easier to work on problems whose concepts have been formulated from the start. However, they are less able to work on problems in the form of stories where the concept of work must be considered one by one. This is due to a lack of accuracy in solving problems and tend to want to solve problems instantly. (3) Task Analysis, with the existing problems researchers want to develop a smartphone application that can facilitate students learning. Applications that will be developed later can be accessed using smartphones owned by students anytime and anywhere. The application will be packed with character content on student problem-solving abilities which are expected to be able to train students in solving problems in the questions and can be an interesting medium for students in learning. The material included in the application is cube and block material.

Design

The design stage is the media design stage. The product to be developed will be adjusted to the problems that exist in the field during the analysis stage. The learning media design stage is carried out by formulating learning objectives from the results of the analysis that will be published in the media. The material that will be included in the media is adjusted to the books used by the school. The initial description of M-learning media is: (1) The initial display is a flash that contains the title of the M-learning media being developed, this initial display is the display that will appear when you first open the application. (2) Display Menu, there are various menu options including guide menus, KI and KD, materials, quizzes, evaluations, and profiles. (3) The help menu contains instructions for using buttons in the application. (4) The KI and KD menus contain core competencies and basic competencies. (5) The material menu contains cube and block material as well as examples of questions and exercises. (6) The quiz menu contains multiple-choice questions and there is automatic scoring when the quiz ends. (7) The evaluation menu contains essay questions to train students' ability to solve word problems. (8) The profile menu contains information about the application maker.

In addition, at this stage, the preparation of the instrument is carried out by compiling lesson plans, syllabus, teacher response questionnaires, student response questionnaires, trial questions, scoring tables, answer keys, and grids which will then be validated with validation sheet instruments consisting of media validation, materials, lesson plans, response questionnaires, and pretest and posttest questions.

Development

At the development stage, all activities carried out at the design stage are compiled and developed into an application. Making this application itself uses PowerPoint to design media that is

converted to .apk format using the Web2Apk application. For the preparation of interactive quizzes on applications using iSpring. The main display of the media can be seen in Figure 2 and Material Menu in Figure 3.


Figure 2. Material Menu Display

Figure 2. Material Menu

Figure 2 is the menu display. The material menu contains material on the surface area and volume of cubical and rectangular shapes. In this section, there is a choice button to go to the desired section and there are also buttons to go to the next page and also to return. In addition, this menu also contains sample questions and exercises.
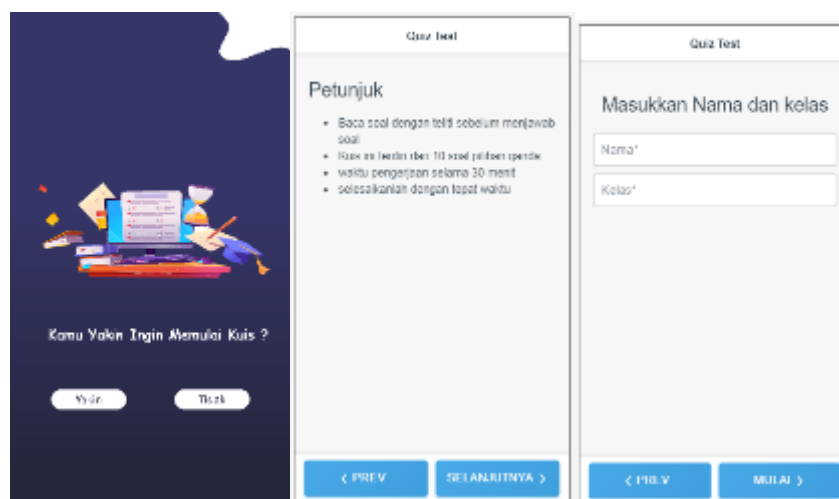
Figure 3. Quiz Menu

The quiz menu in Figure 3 contains quizzes that train students' thinking skills about the material they are learning about the cubes and blocks they are learning. This quiz consists of 10 questions in the form of multiple choices, each question has a score of 10 points with a completeness criterion of 75% correct answers. In this quiz, students can also review the answers that have been chosen and accompanied by answer keys.

Validation and Revision

After completing the application development, then the application will be validated by the validator. This validation was carried out by two experts from the lecturers of the mathematics education study program, and one expert from the mathematics subject teacher at SMP Negeri 10 Sungai Kakap. Each expert becomes a material expert and media expert, as well as a test item validator and a response questionnaire. This means that the three experts and validators assess and provide suggestions for what must be improved from the application and assess whether the trial questions are valid or not, as well as the response questionnaire constructively. Following are the results of the validation assessment. The results of media and material validation show an average percentage of very valid. The results of the media validation assessment contained 17 statements and material validation contained 16 statements. The value given by the validator can be seen in Table 1.

Table 1. Results of Media and Material Expert Validation

Research instrument	Validators			Average Percentage of Total Score	Criteria
	I	II	III		
Media	78,82%	87,05%	91,76%	85,88%	Very Valid
Material	80,00%	90,00%	88,75%	85,25%	Very Valid

There are several revisions provided by the validator. Based on the input and suggestions given, the researcher fixed what the validator suggested. Suggestions and input as well as improvements that have been corrected can be seen from Table 2.

Table 2. Product Revision

Information	Media View	
	Before	After
Answer Button		
Exercise		

The results of media and material validation show several improvements to the applications made. The first input was given by validator I, in the answer buttons for the exercise questions and other answer buttons so that the statement sentences are the same, see the answers. While validator II provides advice on practice and evaluation questions to be more varied so that students can find solutions to different problems. For validator III there is no comment because the material presented in the application is appropriate and the media is also appropriate.

Furthermore, the researcher also validated the teacher and student questionnaires that would be used in this study. Then instrument validation is carried out and the results of the validation value of the instrument can be seen in Table 3.

Table 3. The results of the validation of the instrument

Research instrument	Validator			Average Percentage of Total Score	Criteria
	I	II	III		
Teacher Response Questionnaire	80,00%	88,00%	100%	89,33%	Very Valid
Student Response Questionnaire	80,00%	88,00%	96,00%	88,00%	Very Valid

In Table 3, it is found that the results of the validation of the teacher's response questionnaire instrument and student response questionnaires are more on letter and punctuation errors in writing,

as well as the use of adapted foreign languages and several terms that must be considered again, especially in the use of standard language in Indonesia.

After providing suggestions for improvement, experts also provide an assessment of the application using material and media validation instruments. The three experts stated that the developed application can already be used with repair conditions. Then the data or values that have been obtained from the validation sheet are calculated. The value obtained is very valid. In addition, the application must be fixed before being deployed for testing. Thus the application that has been repaired and declared valid can already be used for a limited trial.

Implementation

At the implementation stage, because conditions did not allow large-scale trials to be carried out, only limited trials were carried out. The school chosen was SMP Negeri 10 Sungai Kakap with 15 students. Effective mobile learning media is being tested at this stage. The purpose of this trial is to see the practical and effective media developed by researchers.

Practicality

The practical applicability of M-learning media can be seen from the results of teachers and students answering the questionnaire. The Practicality assessment is done by teachers and students of SMP Negeri 10 Sungai Kakap. The results of teachers and students answering the questionnaire on mobile learning media are shown in Table 4. According to Table 4.6, the teacher and student indicator percentage achieved a practicality percentage of 93.48%, including the very practical.

Table 4. Teacher and Student Response

No	Aspect	Evaluation (%)	Criteria
1	Teacher Response	90,00%	Very Practical
2	Student Response	96,95%	Very Practical
	Average	**93,48%**	**Very Practical**

Effectiveness

In this study, to see the effectiveness of the M-learning media was measured using an inferential statistical test (t-test). Before doing the calculations on the t-test, first, do the normality test on the pre-test and post-test. The normality test was analyzed using the Lilifors formula to see whether the data obtained from the pre-test and pos-ttest results were normally distributed. The normality test results can be seen in Table 5.

Table 5. Normality Test Results

Normality	N	L_{count}	L_{table}	Test Decision	Conclusion
pretest	15	0,108	0,220	H_0 received	Normal Distribution
posttest	15	0,196	0,220	H_0 received	Normal Distribution

Based on the calculations from Table 5, the pretest value is obtained $L_{count} < L_{table} = 0,108 < 0,220$ and posttest value $0,196 < 0,220$, it can be concluded that the population is normally distributed.

Effectiveness analysis

To find out the effectiveness of M-learning media, know whether there is a significant difference in student problem-solving abilities after being given learning using M-learning media. Based on the normality test, the results show that the data is normally distributed, so it is continued with an inferential statistical test, namely by using the t-test. Based on the results of the t-test, it was found that $t_{count} < -t_{table}$ or -13,392 < -2,145, then H_0 was rejected, which means H_1 was accepted. It can be concluded that M-learning media is effective because there are significant differences in

student problem-solving abilities before and after given learning using M-learning media so M-learning media is effective to be used as a learning medium.

Evaluation

After conducting research using M-learning media, the media designed from the analysis stage to the implementation stage obtained results that match the desired expectations. M-learning media can provide benefits to students to have the ability to solve problems faced by students in everyday life. after going through various inputs and revisions by several validators, M-learning media can be applied independently and widely. Thus, the M-learning media can be transferred back via links with supporting platforms such as ShareIt, Google Drive, Whatsapp, or via Bluetooth.

DISCUSSION

Development research is used to develop mobile learning media that combines character education with geometry problem-solving abilities for junior high school students. The ADDIE model consists of five stages: analysis, design, development, implementation, and evaluation (Hamzah, 2020). The analysis stage aims to observe the problems that exist in schools, especially the problems faced by the teacher and then researchers try to find solutions to the problems found in schools. The design stage aims to make the initial design of the product to be developed by the problems obtained and the solutions offered. The development stage aims to make the product according to what has been previously designed. The implementation phase aims to get feedback from the product developed and see the practical and effective product developed so that the product developed is implemented in a particular subject in this case students at SMP Negeri 10 Sungai Kakap. The evaluation stage aims to provide feedback to product users so that the revision is made by the results of the evaluation or needs that cannot be met by the product (Susiaty et al., 2022).

The first stage in this research is an analysis where the researcher observes the learning in the school and examines the problems in the school. Based on the observation results, it was found that students' problem-solving abilities were still low, as the results can be seen in Figure 1 in the introduction. This happened because learning, which so far had not varied, was compounded by the Covid 19 period so teachers had difficulty designing effective learning. Therefore, one way to help students overcome this problem is to design instructional media that can be accessed easily by students and the media developed must be adapted to the student's educational level. The use of appropriate media in the learning process can help students visualize abstract mathematical concepts, which can stimulate students' interest in learning and stimulate their interest in learning (Saputra & Permata, 2018). One of the learning media that can be developed is learning media that utilizes smartphone technology or commonly known as M-learning (Khomarudin & Efriyanti, 2018) so that M-learning can be accessed on Android or smartphones. Thus, this learning media has become an alternative during Covid 19. The results of the researcher's research show that Macromedia flash contains problem posing can improve problem-solving abilities (Hodiyanto et al., 2020). In the second stage, the researchers designed learning media according to the needs of the school and adapted it to the material needs of the school.

In the next stage, the researcher validated the media developed for material experts and media experts according to the validation index percentage criteria and the response reached the criteria above 61%. Based on the validation results, it was found that the average validation result was 85.57% greater than 61%. Thus it can be concluded that the media is valid and feasible to be used as a learning medium in schools. The results of this study are by previous research that Android-based M-Learning media is very valid (Yani et al., 2021, 2022).

After the media is validated and the results are valid, the product trial continues. This is done to determine the practicality and effectiveness of the developed media. Based on the results of student responses obtained by 96.95% of the 15 students who filled out the questionnaire and the teacher's response results were obtained by 90.00%. The average of teacher and student responses was obtained by 93.48% with very practical criteria. Thus, it can be concluded that the media developed by the

researcher are classified as very practical and can be used as learning media in schools. The results of this study are in accordance with previous research that Android-based M-Learning media is very practical (Yani et al., 2021, 2022).

The effectiveness of this study was carried out by providing pre-test and post-test and subsequently analyzed using inferential statistics, namely the t-test (Gitnita dkk., 2018). This means to finding out the effectiveness of M-Learning media by testing the average difference before and after using M-Learning media to students. The average difference test was done by giving a pre-test and post-test consisting of 4 description questions. The question was given to the same subject, students of class VIII of SMP Negeri 10 Sungai Kakap, totaling 15 students. After getting the pre-test and post-test results then continued with the analysis using the t-test. From the results of inferential statistical tests, the results were rejected, which means that there is a significant difference in problem-solving ability before and after using M-Learning media so it can be concluded that M-Learning media is said to be effective in increasing student problem-solving abilities. This is in line with previous research that learning media can increase the ability to solve problems (Hodiyanto et al., 2020; Yani et al., 2021). M-learning media integrated with character education aims to shape and strengthen student character. This M-learning media also trains students in problem solving abilities through practice questions contained in the media so that it can help students in problem-solving abilities. The results of this study are also in line with research conducted by Nuryadi, (2019) results of the research that the Mobile Learning media developed is valid and practical. Based on the results of this study, the media developed by researchers is classified as effective in improving problem-solving abilities. This happens because M-learning media integrated character education is more attractive to students to be used in learning. In addition, students rarely use androids as learning media so learning by using M-Learning media that is integrated with character education makes students enthusiastic and the curiosity of students is increasingly resulting in an increased ability to solve students' problems.

CONCLUSION

Based on the results of the development, research, and discussion of M-learning media that integrates character education on students' geometry problem-solving abilities, M-learning media is suitable for use as a learning medium. Specifically it can be concluded: (1) The validity of the M-learning media which is integrated with character education on the geometry problem solving abilities is very valid. (2) The practicality of M-learning media which is integrated with character education on geometry problem-solving abilities is very practical. (3) The use of M-learning media that is integrated with character education on geometry problem-solving abilities is as effective. The results of this study can also be developed on other materials and at different subject levels. In addition, subsequent research can deliminate the media developed so that it can be downloaded at Playstore.

The effect of M-learning media on student character in this study is not the main focus so researchers do not see the extent of the influence of M-learning media on student character, but researchers only include elements of character education in M-learning media as an example that character education can be integrated into M-learning media. In addition, seeing the effect of M-learning media on character is not easy and requires a lot of time because it is impossible for the character to change a person's character in just 1 month. Therefore, further research needs to be done to see how M-learning media influences student character.

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