Development Of Flash-Based Learning Media to Improve Mathematics Problem Solving Ability in Stabat Putra Jaya Junior High School

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Abstract. Research to: (1) describe the validity, practicality, and effectiveness of flash-based learning media that have been developed; (2) Produce valid flash-based learning media development products to improve mathematical problem solving abilities. This research is a development research. The development model used is the ADDIE model. From the results of this development obtained: (1) The learning media developed are valid, practical and effective, (2) Practically developed learning media is seen from the responses of experts who state that the learning media can be used with little or no revision. The learning media used developed effectively, seen from the classical student learning completeness has been achieved, positive student responses to the components of learning media and learning activities are developed; and the teacher's ability to manage learning got an average score which was in the good category.

Keywords: Development of learning media, multimedia flash, mathematical problem solving ability,

1. Introduction

The field of mathematics plays an important role in the development of science and technology as well as in the daily life of society (IPTEK). The ability to think differently is directly related to progress and development. In this scenario, we have to show that we can think systematically, critically, rationally, creatively and innovatively. Mathematics is one of the subjects that help students improve and develop their thinking skills.

First, the true meaning of the problem at hand is broken down before moving on to a discussion of how well one can solve the problem. To achieve their professional goals, educators can choose relevant and efficient learning models from a variety of options. Learning models can be considered as patterns of behavior that are expected to be associated with learning. The general pattern of learning describes the process through which educators establish and maintain a learning state or environmental system. Learning patterns are used to characterize student actions.

The abbreviation PBM stands for problem-based learning, which was developed from the phrase problem-based learning (PBI). John Dewey is credited with popularizing the problem-based learning approach. Learning through PBL is an interactive, student-centered experience (Tan, 2004:7). Students are able to empower, hone, test, and improve their thinking skills through the process of working on PBL group projects methodically. Istarani said that she agreed with the statement that "Problem-based learning focuses on student challenges" (2012:32).

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According to Padmavathy and Mareesh (2013), problem-based learning (PBM) refers to an educational setting where difficulties serve as a catalyst for learning. Learning begins with a problem to be solved, and in order for students to overcome that challenge, they need new knowledge.

According to Sinaga and Ani (2019), the Problem-Based Learning Model has the potential to stimulate active learning among students. Students apply the scientific method in order to solve a problem, increase knowledge, and improve their ability to solve problems. Arends (2008:45) asserts that project-based learning requires students to generate and explain real-world phenomena, as well as their own understanding of these phenomena.

Given the importance of mathematics and its role in science and technology as well as international competition, the quality of mathematics education in all fields, types and levels of education needs to be further improved. The government has made efforts to improve the quality of mathematics education today. One of them is to improve the curriculum at the education unit level by creating a 2013 curriculum that meets the requirements. This is reflected in the fact that the previous students' progress

According to the results of a PISA survey conducted on junior high school students in 2018, Indonesian students were ranked 75th out of 80 countries that took part in the survey. Mathematical, reading, and scientific skills are evaluated during the PISA process. Mathematics measures a person's ability to recognize, understand, and apply the basic mathematical concepts needed to function properly in everyday life. The average score in mathematics in Indonesia is 379, which is the rank in Indonesia. This is slightly below the PISA average of 489. It is also much lower than the average score of Malaysia at 59th place with an average score of 440 and Singapore at 2nd place. The results showed that Indonesian high school students had not yet achieved a satisfactory level of mathematics learning. Mathematics teaching does not always go according to plan for all given learning activities. Teachers are one of the factors that determine how well the school education system works. Therefore, it is very important to have competent enough educators who effectively carry out the learning process and carry out the main tasks of education, teaching, teaching, coaching, evaluating and developing students. Teachers must have professional talents to support their performance in order to carry out their duties effectively. According to Aripin (2017), 21st century professional educators must be able to help students acquire skills, which are outlined in the 21st Century Partnership Learning Framework. This is a need imposed on professional teachers in the 21st century. This is related to the teacher's ability to develop learning methods, strategies and models, as well as the teacher's ability to use information technology and media in the learning process. The teacher's ability is related to the student's learning ability.

According to Sinambela (2017: 18), "the curriculum is not just a concept, but how a teacher can create good learning strategies that are in accordance with educational standards and can cover three aspects, namely affective aspects, cognitive aspects, and psychomotor aspects. Problem-solving abilities are required in order to accomplish the cognitive component. It is expected of students that they will be able to apply the talents discussed here to the solution of mathematical problems, in addition to the students' other abilities. The features of a question are called a problem if the question is closely related to a question that challenges the mind and the problem is not immediately known how to solve it. In other words, a problem is a question that has the characteristics of a question. When we are trying to solve problems, we need to think about how we may solve the problem in stages, so that we can reach conclusions that are reliable and accurate.

The statement "mathematical problem solving is one of the important goals in learning mathematics, even the process of solving mathematical problems is at the center of

mathematics" is a quote from Branca (Soemarmo and Hendriana, 2014: 23) that demonstrates the significance of having problem-solving skills. In keeping with this idea, Wandari (2017: 6) asserts that "the ability to solve problems is one of the abilities that must be possessed by students" because "this ability is very useful for students when studying mathematics and in everyday life" (students will find it helpful to have this ability when solving problems in both the classroom and in real life. According to Sadiq (2014: 105), there are four actions that must be followed in order to fix the problem. These phases are as follows: "(1) Fully grasping the nature of the issue at hand; (2) Formulating a strategy for addressing the issue; (3) Carrying out the strategy; and (4) Analyzing or confirming the findings."

The capacity of students to solve problems is currently at a relatively low level, and the low level of students' ability to solve mathematical problems is backed by the findings of various earlier scholars. According to Caprioara (2015: 1862), "Studies conducted on students with significant experience in solving mathematical problems have shown that their results are quite low.," and this is the case even if the problem that needs to be solved does not present a particularly high level of difficulty for that level. This indicates that research carried out on students who have had past expertise in the material aspects of solving mathematical problems has revealed fairly low results, despite the fact that the problems to be solved do not provide a particularly high level of difficulty.

According to Saragih (2014:124), "In the problem-solving, it is often seen that students are only concerned with the final result without knowing how the process if the answer is correct or not." [Citation needed] This frequently leads to the kids providing answers that are inaccurate. This means that when it comes to issue solving, it is common to find that pupils are just concerned with the final result, without making an effort to comprehend whether or not the response process is accurate. The conclusion that "the student's answer is erroneous" frequently emerges as the consequence of this situation. In their study conducted at SMPN 3 Bonegunu, Kadir et al. (2018:3) came to the conclusion that "Factors causing low mathematical problem solving skills are the lack of training in matters relating to mathematical problem solving abilities and the fact that teachers have not used strategies and learning models that can improve students' abilities." kids' ability to solve mathematical problems".

Someone who has a high level of self-efficacy will never stop trying new things and will always be ready to face challenges. "Individuals who have high self-efficacy will be very easy to face challenges," said Bandura (quoted in Zubaidah, 2013, page 35), and "individuals do not feel doubt because they have full confidence in their abilities." According to Bandura and Locke (quoted in Fajri, 2016: 183), "The level of self-efficacy of students reflects the confidence they have in their ability to find solutions to various mathematical challenges. Students who have unpleasant feelings about their own efficacy can avoid challenges, perform tasks in a lackluster manner, concentrate on obstacles, and make preparations for unfavorable outcomes.

Make learning fun and meaningful. A holistic learning pattern describes the process by which educators build and maintain a learning state or environmental system. Learning patterns are used to characterize student behavior. The acronym PBM stands for Problem-based Learning and evolved from the expression Problem-Based Learning (PBI). John Dewey is known for popularizing the problem-based approach to learning. Learning with PBL is a student-centered, interactive experience (Tan, 2004:7). Students can strengthen, refine, test, and refine their thinking skills through the process of systematically working on PBL group projects. Istarani said he agreed that "problem-based learning focuses on the student's task" (2012:32). Ideal for use with technology-based learning media such as worksheets/materials/modules, interactive learning, or other effective, practical, and effective learning media. Shabrina Amalia

(2019) uses these effective, practical and effective learning media to reduce student boredom. Her research shows that it is possible, as the learning process is traditionally a personal learning process for most teachers. The face-to-face method (lectures) leads to boredom and boredom of the students, which lowers their motivation. Teachers are responsible for stimulating interest, motivation and interest in their students and changing perceptions of mathematics so that mathematics learning goals are adequately achieved. One way is to use Adobe Flash software or FlashMedia macros to develop learning media, such as Flash-based interactive media.

However, the reality is that the standard of education in Indonesia is still relatively poor. According to Shoimin (2014:65), various efforts have been made to improve various aspects related to the quality of education in order to better prepare students to take over as the nation's successors in building the nation. These efforts are focused on improving the curriculum, educational objectives, implementation of learning, and evaluation. When there are new curriculum devices or curriculum improvements that are being implemented, there are also efforts related to improving the objectives and curriculum being carried out (Depdiknas.2006:120). It is important to play an important role in the overall quality of the educational process to contribute to this effort. According to Joyce (2011:233):

"Because the effectiveness of the education process is very dependent on the teacher who acts as the spearhead of implementation, one of the components that play an important role in maintaining the quality of the education process is the teacher. In addition, one of the components that play an important role in the implementation of the educational process is the teacher. Therefore, efforts to improve the quality of education should initially focus on improving the competence of educators. One of the skills that teachers need to have is the ability to design learning strategies that are in accordance with the objectives or components to be achieved, because this is one of the abilities required of them. This is because not all goals can be achieved with one strategy."

The word independence has a very relative meaning. Basically the word independent means independent from others and free to do it yourself. The term often applies to different meanings and degrees of independence. Students learn certain topics or subjects by reading books or watching or listening to audiovisual media programs (audiovisual) without the help of others or with limited assistance. This means that independent learning is a process of consultation, decision and adaptation. It mainly consists of knowledge, beliefs and learning skills. It is also viewed as a process in which students activate and maintain systematically oriented cognitive, behavioral, and impactful goals. Rafika, Israwati and Bachtiar (2017) say that teachers can create independent learning by encouraging students to be interested in what is being taught to support their learning activities through motivation and topic planning.

In a broad sense, learning autonomy means that individuals take the lead in diagnosing learning needs, developing learning goals, identifying learning resources, and choosing a learning strategy approach, with or without the help of others. Represents the process of determining and evaluating learning outcomes achieved. This means that the independent learning atmosphere provides choices, constructive criticism, and guidance in learning activities.

According to what Hasratuddin said in his article (2015:23): Mathematics is a science as well as intuition that can strengthen a belief or faith; Therefore, mathematics is very important and useful in everyday life and in supporting the development of human resources. This is due to the fact that mathematics is both a science and an intuition. In addition, mathematics contains thinking tools that can help develop logical, systematic, objective, critical, and rational thinking patterns. Because this pattern of thinking is so capable of shaping personality, it is very important for everyone to gain ground in mathematics. According to the explanation given by

the Directorate General of GTK Kemdikbud (in Purba 2017:2), “things that need to be developed in learning mathematics are 1) mastery of mathematical concepts; 2) problem solving ability; 3) the ability to reason and communicate; 4) the ability to think creatively and innovatively”. The questions used in TIMSS and PISA were developed with reference to mathematical ability, which distinguishes them from other questions used in this study. "Abilities that must be achieved in learning mathematics include: (1) problem solving skills, (2) reasoning skills, (3) communication skills, (4) connection skills, and (5) representation skills," said (2000). :4) National Council of Mathematics Teachers (NCTM). According to Sadiq (2014: 105), to solve problems effectively, four steps are needed that must be completed in the appropriate order. This includes (1) having an understanding of the problem, (2) having a plan for a solution, (3) having the plan implemented, and (4) interpreting the results or examining them.

The development of learning media is very important. By using learning media, it will be like that. It is common knowledge that students' problem-solving abilities play an important role in the level of success they achieve when learning mathematics. Furthermore, those who specialize in the field of mathematics education recommend that students' problem-solving abilities continue to be developed and improved. This is based on the description that has been given earlier in this paragraph.

Many factors play a role in learning problems that cause students to fail academically, including factors related to students, teachers, learning processes and curriculum. Looking at the curriculum 1975, 1984, 1994, KBK, KTSP, 2013, the purpose of learning mathematics is so that students can apply the mathematics they have learned at school in their daily lives, or to other students.

This appendix contains the skills or abilities that students need to learn mathematics. Understanding mathematical concepts and their relationships, generalizing based on phenomena/data, or analyzing problem solving components that exist both in the context of mathematics and outside mathematics. National Council of Mathematics Teachers. Instructors found that students were not accustomed to working through the stages of problem solving when they were solving problems. The process of carrying out calculations, as well as checking both the process and the results of these calculations, is the time most often experienced by people.

This involves students in the process of finding solutions to problems and instructing or introducing students by responding to questions in class that require problem solving. According to Mataka (2014:164-174), "to improve students' problem-solving skills, teachers need effective teaching strategies". This was revealed in a study. Teachers have access to a variety of pedagogical approaches, strategies, and instructional models. Throughout the entire 2013 academic program, students are expected to actively participate in the learning process. According to Problem solving skills are needed to achieve the cognitive component. Students are expected to be able to apply the skills discussed here to mathematical problem solving, in addition to other students' abilities. In other words, a problem is a question that has the characteristics of a question. When we try to solve a problem, we need to think about how we can solve the problem step by step, so that we can reach reliable and accurate conclusions. Students have a great chance to be proficient in this ability if they are also proficient in affective abilities, one of which is self-efficacy.

Someone who has a high level of self-efficacy will never stop trying new things and will always be ready to face challenges. "Individuals who have high self-efficacy will be very easy to face challenges," said Bandura (quoted in Zubaidah, 2013, page 35), and "individuals do not feel doubt because they have full confidence in their abilities." According to Bandura and Locke (quoted in Fajri, 2016: 183), "The level of self-efficacy of students reflects the confidence they

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"Development of Flash-Based Learning Media to Improve Mathematical Problem Solving Ability and Independent Learning of Students at SMP Putra Jaya Stabat". was to investigate these questions.

2. Research methods

Research type

This study develops a learning medium. ADDIE (analysis, design, development, implementation, evaluation) type of development is used to build and validate general products. Research theme and purpose.

Research Subjects and Objects

The subjects of this study are students in Class VIIIA and VIIIB SMP Putra Jaya Stabat T.A 2021/2022 and the purpose of this study is to develop a Flash-based learning medium based on the problem-based learning model of the SPLDV material, mathematical problem solving was. Student skills and learning independence. The method developed in this study is limited to Flash-based learning media.

2.1 Data analysis

Data analysis Flash-based learning media validity data analysis

This review is based on the opinions of her five experts and practitioners in the field of education. Calculate the average value of each aspect based on the report, and calculate the average value of the overall aspect. Data analysis on the practicality of Flash-based learning media

Experts say problem-based learning methods can be used with little or no validation. To assess the usefulness of Flash-based learning media, validate the sheet using rating scales and problem-based learning. Use Flash-based learning media and provide observation sheets during study. Observations by previously directed observers to the learning process to ensure proper implementation. Observation sheets of Flash-based learning media were rated from 1 to 5: 5

(very good), 4 (good), 3 (fair), 2 (poor), 1 (poor). Data analysis on the effectiveness of Flash-based learning media

Data on student proficiency, learning goal achievement, and student response were used to test the effectiveness of Flash-based learning media. Effectiveness of Flash-based learning media in improving math problem-solving skills. A student's score of 75 is the minimum degree of completion. KKM Class VIII SMP Putrajayastabath he is 75 years old. A lesson is considered Classic if at least 75% of the candidates scored 75 or above. Data collection tools and techniques

Validation of Learning Media Validation of Flash-based learning media. Learning Media Approval Form. This sheet evaluates format, language, images, and content. A test vehicle for mathematical problem-solving ability is a structured written test. Student reaction means. The Student Answer Questionnaire gathers student feedback on suggested Flash-based learning elements and media. Distribution of questionnaires on learning independence to students aided in data collection. The survey asked students about their interest, enjoyment, timeliness, and ease of understanding problem-based learning methods.

2.2Learning Media Development Procedure

Analysis phase

In the analysis phase, the purpose and limitations of the material are analyzed to determine learning needs. This step includes a preliminary analysis, an analysis of the materials used, and an analysis of the curriculum from multiple sources used by the school, which will be incorporated into Flash-based learning media. design stage

The basis of content creation is the editing of templates that will later be used in Flash-based learning media and the elements and content that will later be displayed in the used Flash media. Flash media is selected for the presentation. Media selections using Adobe Flash applications or Macromedi Flash are conceptual and appropriate visual media. The format of content displayed in Flash media, such as images, animations, and sounds, is later deployed in the product. this is draft I

Development stage

Development is his third step in the ADDIE system design model. Development steps include activities for creating, purchasing, and modifying learning media. In other words, it includes the activities of selecting and determining appropriate methods, media and learning strategies to use in delivering program materials and content. Implementation stage

Implementing or delivering learning materials is the fourth step in the ADDIE learning system design model. The main purpose of this step is to guide the participant towards a goal or skill, solve problems to fill the gaps in the learning outcomes they face, and welcome the participant to the end of the learning program. Skills in the form of problem-solving skills and mathematics problems that require independent learning. During the validated media implementation phase, not only trials, but trials of media are run until significant results are obtained.

Verification/evaluation (evaluator)

This activity is graded. Expert validation gathers feedback on the design of our learning technology. Developed learning tools. equipment test

Mathematical problem-solving skills and student learning autonomy were used as research tools. Before using the learning tool, I tested it on a non-sample class. In addition, efficacy and reliability tests were also performed. The goal of this process step is to produce a high quality research tool, both in terms of adequacy and suitability for use in field trials. Field test

To get direct feedback on the learning device, a field trial was conducted and the learning device was perfected. Schools evaluate learning aids to improve students' critical thinking skills in mathematics. Evaluation stage

This activity is executed in all phases of all steps. The ADDIE model is evaluated for bias for further development. This phase is carried out to maximize the development of learning media.

3. Result

Validation of Learning Tools by Using Problem-Based Learning Tools by Using Developed

Validation of Flash-based learning media This research uses a problem-solving ability test. Before using the research instrument, its validity and reliability were evaluated in the non-sample class. To create a valid and usable research instrument. The results of the validity and reliability tests are:

By comparing the item scores with the total scores, the validity of the questions is determined. Table 1 shows the results of the student's mathematical critical thinking test... as follows.

Table 1. Validity of Mathematical Critical Thinking Ability Question Items

Question points	r_{xy}	r_{tabel}	Interpretasi
1.	0,838	0,374	Valid
2.	0,726	0,374	Valid
3	0,637	0,374	Valid
4	0,701	0,374	Valid

In Table 1 above, we get a test of research instruments for testing a student's mathematical problem-solving ability for four essay questions with a significance level of 5%, dk = 28, and rtable = 0.374. A problem solving ability test is enabled or valid if the reference to the test criteria is rcount > rtable. Therefore, it is concluded that the student's mathematical problem-solving ability test is usable or valid, based on hand calculations and Excel. Table 2 presents the results of expert and practitioner evaluations of the practical suitability of Flash-based learning media. Below: Practicality of Learning Media with Developed Flash-based Learning Media.

Table 2. Learning Media Validation Results

Validator	**Media Pemebalajaran**				
	Tata letak	**Tulisan**	**Warna**	**animasi**	**Bahasa**
Validator 1	RK	RK	RK	RK	RK
Validator 2	RK	RK	RK	RK	RK
Validator 3	RK	TR	TR	TR	RK
Validator 4	RK	TR	TR	TR	TR
Validator 5	RK	TR	TR	TR	TR

Information:

RK : Learning media can be used with "small revisions"

TR : Learning media can be used “without revision”

In Table 2, experts and practitioners say Flash-based learning media requires little or no change. Experts say that Flash-based learning media meets practical standards. The practicality of the media will also be checked. PBM implementation is measured through observation sheets. PBM data analysis results.

3.1 Effectiveness of Learning Tools by Using Problem-Based Learning Tools by Using Developed

PBM tools are viable when they facilitate learning. Therefore, her PBM tools developed must meet efficacy criteria. (2) achieve at least 75% of the learning objectives; (3) at least 80% of surveyed subjects give positive responses to the components of the PBM tool; (4) The minimum learning time is the same as the conventional method. Since none of the criteria were met in the first trial, the second trial described the effectiveness of the learning media. Mathematical problem-solving proficiency of 61.76% on the Preliminary Exam II and 77.94% on the Post-Exam II. The post-test results for solving mathematical problems correspond to classical perfection at 77.94% completion. In the second test, the learning materials met the usual standards of completeness using Flash media. His results for mathematical problem-solving skills on his second attempt to meet the learning objectives were 92.71% for index 1, 82.81% for index 2, and 78.47% for index 3. According to the learning objective achievement criteria, the learning objective was achieved with a score of up to 75% on each item, so the achievement of the post-test results of the second field experiment enabled the learning objective to be achieved. The task difficulty index (level) has an average value of 3.5, the stability, limit or range index is 3.4, and the local behavior index (overall) is 3.4.

The second trial period will consist of 3 meetings. Comparing the first-trial PBM training time with the normal training time, no difference was found. Improving students' math problem-solving skills

Analysis of the improvement in the student's mathematical problem-solving skills on the first trial is evident by her N-reinforcement from the results of the pretest and posttest of the student's mathematical critical thinking skills on the first trial. The results of the N-Gain calculation for Mathematical Critical Thinking Skills can be found in the table below:

Table 3. Summary of N-Gain Results of Mathematical Problem Solving Ability Trial I

Rentang	**Kategori Peningkatan**	**Jumlah Siswa**	**Persentase**
$N \geq 0,7$	Tinggi	0	0%
$0,3 \leq N < 0,7$	Sedang	27	79%
$N < 0,3$	Rendah	7	21%

In Table 3, 0 students have an N-Gain score greater than 0.7. Twenty-seven students experienced improved math problem-solving skills or again achieved an N-gain score of 0.3 g 0.7 in the moderate category, and she had seven students with an N-gain score of less than 0.7. The g of 0.3 in the first "low" category represents a trial mean of 0.51 gain. How Flash-based learning media improve students' problem-solving skills after initial experiments.

An analysis of the improvement in students' mathematical problem-solving ability on the second trial is evident from the N-gains from the pre-test and post-test data. A summary of N-gains for math problem-solving skills is shown in Table 4:

Table 4. Summary of N-Gain Results of Experimental Mathematical Problem Solving Ability II

Rentang	Kategori Peningkatan	Jumlah Siswa	Persentase
$N \geq 0,7$	Tinggi	13	38%
$0,3 \leq N < 0,7$	Sedang	19	56%
$N < 0,3$	Rendah	2	6%

From Table 4 above, we can see that 13 students had N-Gain values > 0.7 according to Table 4. Nineteen students improved their math problem-solving skills in the moderate category or achieved her N-Gain scores of 0.3 to 0.7. and her two students of the lower category. Her 0.62 average win rate on the second try is pretty decent. In a second experiment, Flash-based learning media improved students' math problem-solving skills.

4. Discussion

Learning media, Learning Implementation Plans (RPP) and Student Worksheets (LKPD) are determined to be validated or quite valid based on the validation results of the developed Flash-based learning media. Student learning independence is also valid or has a high level of relevance. This shows that the Flash-based learning media developed by the RPP learning media, LKPD, Mathematical Problem Solving Tests, and the Student Learning Independence Questionnaire have met the validity criteria.

According to Saragih (2014:124), "In the problem-solving, it is often seen that students are only concerned with the final result without knowing how the process if the answer is correct or not." [Citation needed] This frequently leads to the kids providing answers that are inaccurate. This means that when it comes to issue solving, it is common to find that pupils are just concerned with the final result, without making an effort to comprehend whether or not the response process is accurate. The conclusion that "the student's answer is erroneous" frequently emerges as the consequence of this situation. In their study conducted at SMPN 3 Bonegunu, Kadir et al. (2018:3) came to the conclusion that "Factors causing low mathematical problem solving skills are the lack of training in matters relating to mathematical problem solving abilities and the fact that teachers have not used strategies and learning models that can improve students' abilities." kids' ability to solve mathematical problems".

The developed Flash-based learning media meets the criteria for effectiveness, but there are several aspects such as content, language, and structure that need to be modified according to the reviewer's suggestions. This Flash-based learning media based on the validator's comments meets the validity criteria of the valid category, and mentions several minor revisions. In addition, the Flash-based learning media was revised according to the verifier's suggestion.

The statement "mathematical problem solving is one of the important goals in learning mathematics, even the process of solving mathematical problems is at the center of mathematics" is a quote from Branca (Soemarmo and Hendriana, 2014: 23) that demonstrates the significance of having problem-solving skills. In keeping with this idea, Wandari (2017: 6) asserts that "the ability to solve problems is one of the abilities that must be possessed by students" because "this ability is very useful for students when studying mathematics and in everyday life" (students will find it helpful to have this ability when solving problems in both the classroom and in real life. According to Sadiq (2014: 105), there are four actions that must be followed in order to fix the problem. These phases are as follows: "(1) Fully grasping the

nature of the issue at hand; (2) Formulating a strategy for addressing the issue; (3) Carrying out the strategy; and (4) Analyzing or confirming the findings."

And the verification results of the verifier on the Mathematical Problem Solving Ability Test and the Learning Independence Questionnaire also met the content adequacy criteria. The Mathematical Problem Solving Ability Test consists of four post-tests, each of which contains four measures of measurable mathematical problem solving abilities. In addition, non-sample statistical validation or instrumental tests were carried out in the form of tests on students to confirm the validation of the items. From the results of the statistical validation, four math post test questions met the valid criteria. The effectiveness criteria were determined by expert assessment of the developed Flash-based learning media. The acquisition of effective learning media is driven by several factors, including: (1) the developed learning media meets the effectiveness of the content; This means that the development of Flash-based learning media is in accordance with the needs of the existing curriculum. The existing curriculum relates to core competencies (AI) and basic competencies (KD) that students must achieve in targeted learning activities. Material or content for lessons provided. The above is my opinion with Ari (2009: 57) stating that the effectiveness of the content is good if the learning device can measure a certain goal parallel to the lesson material or content provided. Content validity is also called curriculum validity.

According to Sinambela (2017: 18), "the curriculum is not just a concept, but how a teacher can create good learning strategies that are in accordance with educational standards and can cover three aspects, namely affective aspects, cognitive aspects, and psychomotor aspects. Problem-solving abilities are required in order to accomplish the cognitive component. It is expected of students that they will be able to apply the talents discussed here to the solution of mathematical problems, in addition to the students' other abilities. The features of a question are called a problem if the question is closely related to a question that challenges the mind and the problem is not immediately known how to solve it. In other words, a problem is a question that has the characteristics of a question. When we are trying to solve problems, we need to think about how we may solve the problem in stages, so that we can reach conclusions that are reliable and accurate.

Second, (2) the developed Flash-based learning media meets construct validity. That is, the development of flash-based learning media is carried out in accordance with the concepts and indicators of mathematical problem-solving ability and combined with the developed flash-based learning media. The Flash-based learning media that we have developed are positioned to complement each other between lesson plans and worksheets used to measure mathematical problem solving abilities. Recognizing the good aspects of validity above, Akbar (2013: 152) added that high validity was achieved through validation tests on the learning media he developed.

Based on the findings and supporting research that we conducted, it can be concluded that the developed Flash-based learning media meets the expected validity criteria. In this way, you can use Flash-based learning media that has been developed.

The capacity of students to solve problems is currently at a relatively low level, and the low level of students' ability to solve mathematical problems is backed by the findings of various earlier scholars. According to Caprioara (2015: 1862), "Studies conducted on students with significant experience in solving mathematical problems have shown that their results are quite low.," and this is the case even if the problem that needs to be solved does not present a particularly high level of difficulty for that level. This indicates that research carried out on students who have had past expertise in the material aspects of solving mathematical problems

has revealed fairly low results, despite the fact that the problems to be solved do not provide a particularly high level of difficulty.

5. Conclusion

Flash-based learning media for improving students' math problem-solving skills and learning independence met valid criteria, including

1). Test items developed for mathematical problem-solving ability can be used or validated. A statement item questionnaire on student independent learning attitudes with dk = 28 and a significance level of 5% yielded rtable = 0.374. A learning-independent questionnaire can be used or is valid if the test criterion is associated with a test criterion where rcount > rtable.

2) The learning media developed meet practical standards in that: (b) The learning media implementation achieved 3.82 high categories on the first trial and 4.17 very high categories on the second trial.

3) The learning medium developed meets the criteria for effectiveness. Effectiveness criteria related to: (a) Classical student learning completeness was 77.94% on the second trial; (b) A positive student response of 80% or more to the components of the learning tools and learning activities developed; (c) Teachers' learning management ability achieved an average of 4.07, which is included in the good category (3.50 KG 4.50).

4) A student's improvement in mathematics problem-solving ability using Flash-based learning media with a two-variable linear system of equations teaching material reportedly increases when considering her N-Gain test on the first attempt. 27 people in middle school and 0 in high school. On the second trial, 2 students received the low category, 19 students received the medium category, and 13 students received the high category. On this occasion, the authors would like to thank the Director and Deputy Director of the UNIMED Graduate Program, the Director of the UNIMED Graduate Program in Mathematics Education and Research, and the UNIMED Library.

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