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THE DEVELOPMENT OF MICROSOFT POWERPOINT-ASSISTED WORKSHEET TO INCREASE STUDENTS' MATHEMATICAL PROBLEM SOLVING ABILITY

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ABSTRACT

SMP Al-amin is a private school located in the district of Kandanghaur - Indramayu. The learning resources provided by the Government only provide books for teachers and do not provide worksheet to students. Therefore the researcher wants to make PowerPoint-assisted worksheets to increase enthusiasm, student interest in learning, and student motivation while studying. The purpose of this research is to produce student worksheets assisted by Microsoft PowerPoint. The research method used is research and development (R&D) and the ADDIE learning design. The stages of the ADDIE development model are as follows: analysis, design, development, implementation, and evaluation. The subjects of this study were class VIII students of SMP Al-Amin Kandanghaur. the instruments used were feasibility analysis, student response questionnaires, and teacher response questionnaires. Based on the research findings, the PowerPoint-assisted worksheet was declared "feasible" with a feasibility value of 80%. In addition, the student and teacher response questionnaire rates were 79%, indicating that these PowerPoint-assisted worksheets are "handy". Thus it can be concluded that the use of PowerPoint-assisted WORKSHEET in the two-variable linear equation system (SPLDV) subject can be said to be a safe, practical, and effective learning mediumkeywords.

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INTRODUCTION

Education is an aware and intentional attempt to create a learning atmosphere and learning process, it requires students to be able to increase human dignity which is achieved through a long and lasting process. Learning is an interactive process between teachers and students or

otherwise, which is designed to construct an active and innovative learning and to achieve affective learning outcomes: the affective aspect is facet of emotions, feelings, likes, activities, and integrity (Kasenda, Sentinuwo, et al. & Tulenan; 2016).

One of compulsory subjects at school that must be learned by students is mathematics. Mathematics is a subject that contains a lot of abstract materials, thus some students deem mathematics as a difficult, scary, and stressful subject (Siregar, and Intisari; 2017). Ironically, the importance of mathematics is conquered by students' stigma. Students consider mathematics as abstract and unimaginable; therefore they keep assuming that "Mathematics is difficult" (Dewi; 2022).

Based on data from interviews with mathematics teachers at SMP Al-Amin Kandanghaur, researchers found that some students did not achieve a minimum score of 70 as the minimum passing score (Kriteria Ketuntasan Minimal) in mathematics. Students seem less motivated to know mathematics subject matter, students are also generally passive, because students are not given the opportunity to be active during the learning process, most students only accept what the teacher dictates so that learning mathematics becomes boring (Luthfiana; 2019). So the use of innovative learning models and learning tools is the right solution so that students are no longer bored while studying. Learning tools that are commonly used are curriculum, lesson plans, teaching materials and learning achievement tests. One of the printed teaching materials used in learning at school is worksheet (Zulfah et al; 2018).

Improving students' mathematical problem-solving abilities must be supported by appropriate learning methods, thus the learning objectives can be achieved. Mahriady et al (2022) stated that one important aspect in designing a lesson is the teacher's ability to anticipate students' needs and to create materials or models that can help students to achieve the learning objectives. Therefore, a learning media that can help to improve students' mathematical problem-solving abilities is needed. Teachers must be able to advance learning strategies by selecting the right learning tools: students' worksheet. According to Prastowo (2018) worksheet is a printed teaching material that contains material, summaries and assignments that must be completed by students based on certain basic competencies (Kompetensi Dasar).

Previous research that had been conducted by Widodo and friends (2018) showed that the use of inappropriate teaching materials affected the suboptimal of students' mathematical problem-solving abilities. Besides using learning models, researcher uses Microsoft PowerPoint in the research as well. Darwis, HR (2020) stated that the use of PowerPoint through an exploratory learning approach makes students more active in the learning process and stimulates their thinking skills. In addition, through activities such as observing and comparing various problems related to the materials, focusing on the elaboration of the model as the root of conceptual meaning, participating in discussions actively; it turned out that students' problem solving abilities had improved significantly and positively. The researcher concludes that the use of PowerPoint on mathematics learning can advance students' learning outcomes.

Based on observation conducted by researcher at Al-Amin Middle School in the System of Linear Equations in Two Variables (SLETV) material, there was a problem during the learning process: the deficiency of learning resources. The provided-resource book in this school just only teachers' handbooks, which was the textbook provided by the government. Besides, there was no student activity in the learning process because the teachers did not apply learning models and learning media in the class. Based on these problems, the researcher is interested in conducting research on "Developing worksheet assisted by Microsoft PowerPoint to improve mathematical-problem solving ability", hence the students are expected to be more active and be able to achieve better learning outcomes.

METHOD

This research is a type of Research and Development (R&D), using the ADDIE model of instructional design. The ADDIE model is selected based on learning design theory in order to solve the learning and teaching problems (Made et al, 2014). The developed-product in this research is the PowerPoint-assisted worksheet in System of Linear Equations in Two Variables (SLETV) material for grade VIII Junior High School. There are 5 stages in The ADDIE model, they are: (1) **A**nalysis, (2) **D**esign, (3) **D**evelopment, (4) **I**mplementation, and (5) **E**valuation (Sugiyono, 2015:200). The stages in this research can be described in the figure 1:

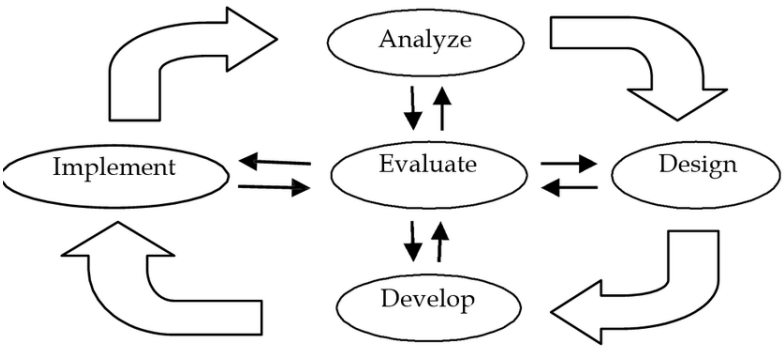


Figure 1. The research stages of ADDIE Model

The research stages as shown in the Picture 1 above can be described in each stage as follows:

1. Analysis
   At this stage, the researcher observes and analyzes the existing problem in the area where the research takes place. The result of the analysis will be evaluated in order to go on to the next stage.
2. Design
   At this stage, the researcher creates an initial draft of the design, which contains teaching materials, the structure of teaching materials, and also compiles research instruments and feasibility analysis instruments.
3. Development
   At this stage, the researcher describes the results of the design or the developed-design and then evaluates the feasibility assessment results in the limited and expanded trials.
4. Implementation
   This stage is activity to apply or use the product. The developed-worksheet will be tested on junior high school students grade VIII. The test will be carried out in learning SLETV used the developed-teaching materials assisted by PowerPoint. Achievement test will be given as well in order to determine students' mathematical problem-solving abilities in the end of the learning process.
5. Evaluation
   At this stage, the research conducted feasibility assessments to some aspects in the development of teaching materials; they are content, presentation, language, and graph.

The assessment is accomplished in order to find out the quality of the developed teaching materials.

The subjects of the limited trial in this research were students (grade VIII) in Al-Amin Middle School Kandanghaur – Indramayu. The instruments that used were interview guidelines for teachers and questionnaires for examining the product feasibility. In this research, interviews were conducted to analyze the needs for creating the PowerPoint-assisted worksheet. The questionnaire is a tool which is used to gather information by submitting several questions to be answered by the respondents.

In this research, the data analysis process started from analyzing the results of feasibility assessments, students' responses in questionnaires, and the teachers' response in questionnaires. The questionnaire is using a Likert scale with criteria 5 = very good; 4 = good; 3 = enough; 2 = less; 1 = poor. The formula used to analyze is:

$$P = \frac{\sum x}{\sum x_i} \times 100\%$$

(Arikunto, 2010)

After getting the percentages from the analysis, then matching up each percentage with some criteria of teaching material and questionnaire as shown in the table 1 and table 2:

Table 1. Criteria for the Feasibility Percentage of Teaching Materials

Range of Percentage (%)	Criteria	Follow-up
0 - 20	Not feasible	Cannot be used
21 - 40	Less feasible	Major revision needed
41 - 60	Decent feasible	Revision needed
61 - 80	Feasible	Minor revision needed
81 - 100	Very feasible	No revision needed

Table 2. Criteria for the Practicality Percentage of Questionnaire

Range of Percentage (%)	Criteria	Follow-up
0 - 20	Not practical	Cannot be used
21 - 40	Less practical	Major revision needed
41 - 60	Practical enough	Revision needed
61 - 80	Practical	Minor revision needed
81 - 100	Very practical	No revision needed

RESULTS AND DISCUSSION

Result

The result of the research was the development of the PowerPoint-assisted worksheet and the elaboration consisted of (1) the development process of the PowerPoint-assisted worksheet, (2) Feasibility analysis result of the worksheet, and (3) Practicality analysis of the worksheet.

1. **Analysis**

   Preliminary research is the initial stage in conducting R&D model. At this stage, researcher made observations and collected data related to learning activities. The researcher also discussed with other mathematics teachers about the topic, and turned out that System of Linear Equations in Two Variables (SLETV) would be used in the worksheet referring to the learning outcomes of the 2013 curriculum (C13). According to the preliminary research, the researcher regarded students' as active and inquisitive. The researcher developed worksheet assisted by PowerPoint based on students' needs as it was expected to ease the learning process and provide an innovative worksheet that students would relish.

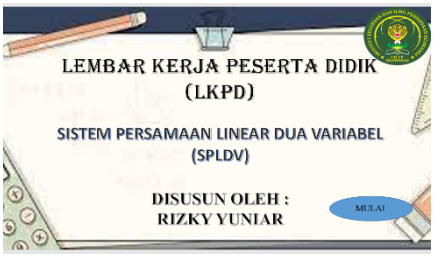
2. **Design**

   The first step in this stage was to design the worksheet assisted by PowerPoint. The slides was created and adjusted according to the learning activities stages that had been made in the form essay in order to analyze students' viewpoints and accuracy. Not only that, feedbacks also created in the worksheet, such as appreciation and correction. The appreciation appeared if the student answered correctly while the correction appeared if the student's answer was incorrect. Herman (2005 in Febriyanti, 2015) stated that direct feedbacks in the worksheet could motivate students to keep trying until they answered correctly. Instructions and feedbacks in the form of appreciation and correction could be used to improve students' motivation and abilities.

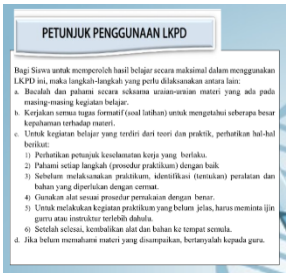
3. **Development**

   Before the developed-worksheet being tested on students, feasibility assessments were carried out by media experts and material experts. Media expert were ICT teachers at Al-Amin Middle School. While material experts were 2 mathematics teachers at Al-Amin Middle School. The assessment results obtained from media experts and material experts would be used as references for improvement before the worksheet being tested on students. The worksheet was presented in the following table 3:

Table 3. Worksheet assisted by PowerPoint Slideshows

No	Slides	Descriptions
1		**Worksheet Cover** Consisted of IKIP Siliwangi logo, the title of the worksheet, and material identity. Not only that, it also contained of START button to continue to the next slide.

2



Instructions

Contained of instructions to accomplish the worksheet. It also consisted of "<" button to go to the previous slide and ">" button to go to the next slide.

3

Group Names

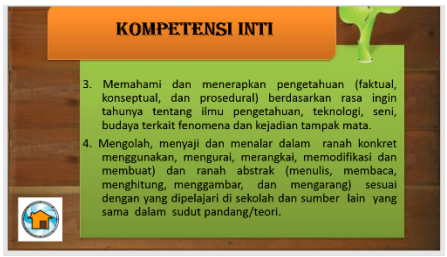
Contained of allocated-time to accomplish the worksheet and provided-spaces to write names of the group members. It also consisted of "<" button to go to the previous slide and ">" button to go to the next slide.

4

Mind Map

Contained of the sequences of learning process.

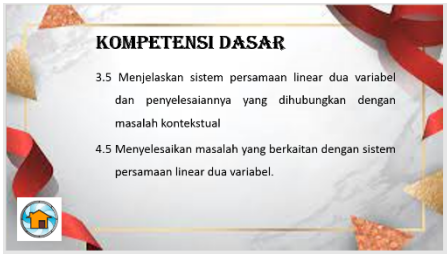
5



Core Competencies

Contained information about the core competencies that must be achieved by the students.

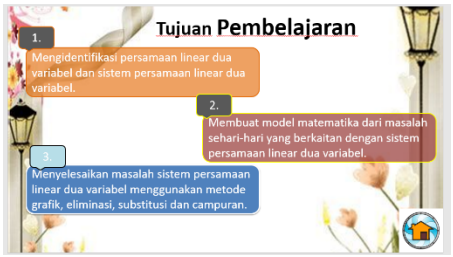
6



Basic Competencies

Contained information about materials that will be learned in System of Linear Equations in Two Variables (SLETV).

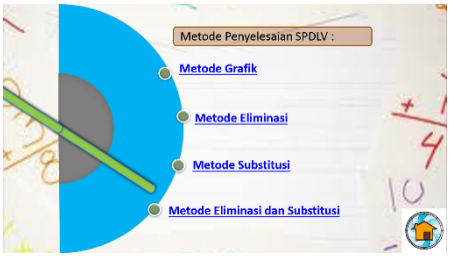
7



Learning Objectives

Contained of some aspects that must be achieved by the students after learning SLETV.

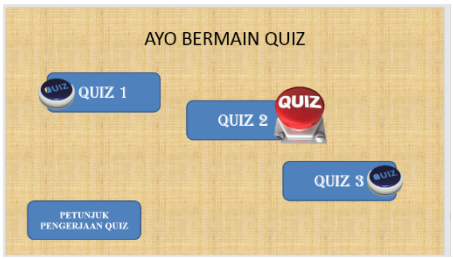
8



Methods of Solving SLETV

Contained of some methods that can be used to solve questions about SLETV.

9



Quiz

Contained some questions to examine students' understanding of the materials that has been delivered.

Assessment from media experts was examined to find out the feasibility of the PowerPoint-assisted worksheet. The percentage gained from ICT expert was 79,30%, considered as "feasible" and minor revision needed, by the percentage values of each ICT expert were 78,78% and 79,83%. The results of assessments from the ICT experts were presented in the following table 4:

Table 4. ICT Experts Assessment Results

No	Experts	Total Score	Percentage	Criteria
1	ICT 1	72	78,78 %	Feasible
2	ICT 2	79	79,83 %	Feasible
Total		151	**79,30 %**	**Feasible**

Assessment from material experts was examined to find out the feasibility of the PowerPoint-assisted worksheet. There were several aspects that would be assessed: feasibility of content, feasibility of presentation, and feasibility of language. The average percentage gained from material experts was 80%, considered as "feasible" and minor revision needed: the percentage values of each material expert were 78% and 82%. The results of the material experts test assessment were presented in the table 5:

Table 5. Material Experts Assessment Results

No	Experts	Total Score	Percentage	Criteria
1	Teacher 1	78	78 %	Feasible
2	Teacher 2	82	82 %	Very feasible
	Total	160	**80 %**	**Feasible**

Several revisions given by media and material experts had been revised in the the PowerPoint-assisted worksheet, they were: (1) rearranging the sequence of slides so the students' knowledge about SLETV would be well-constructed, and (2) adding more slides to enhance students' knowledge about the methods to solve questions of SLETV.

4. Implementation

In this stage, the researcher gave questionnaires to 6 representative students as the worksheet users. Assessment was carried out by examining the feasibility of contents and presentation that contained some aspects; usefulness (*kebermanfaatan*), easiness (*kemudahan*), helpfulness (*keterbantuan*), and attractiveness (*kemenarikan*). Therefore, the average percentage from audiences' assessment was 79%, considered as "practical": 100% for the usefulness aspect, 50% for the easiness aspect, 88% for the helpfulness aspect and 78% for the attractiveness aspect. The results of the students' responses were presented table 6:

Table 6. Audiences' Responses Results

No	Aspect	Percentage	Follow-up
1	Usefulness	100 %	No revision needed
2	Easiness	50 %	Revision needed
3	Helpfulness	88 %	No revision needed
4	Attractiveness	78 %	Minor revision needed
Total		**79 %**	**Minor revision needed**

5. Evaluation

Based on the findings above, the result of this research was the developed product, which was the PowerPoint-assisted worksheet in SLETV materials. At this stage, some revisions were made according to revisions and suggestions from media and materials experts and from the teachers as well. The revisions given were: (1) the placement of text and animation in order to minimize the excessive empty space and (2) the text analysis did not have to be from a textbook. Due to the less development of innovative teaching materials in Covid-19 pandemic, the development of worksheet had to be accomplished. The assessments of teaching materials according to media and material experts stated that this worksheet was feasible of being tested to students, by correcting some revisions and suggestions given by experts.

The result of the students' response questionnaires showed that the worksheet helped students to learn easily. Because of the attractive teaching material, the students would be enthusiastic to learn and encourage the students to willingly seeking additional information. If student had a great enthusiasm to learn, then the learning outcomes would be well-achieved.

Discussions

This research conducted the development of PowerPoint-assisted worksheet in order to improve students' mathematical problem-solving abilities by using ADDIE model of instructional design. The first stage in this model was Analysis: analyzing the teaching material, learning process, and students' needs. The next stage was Design, which was related to learning activities that would be accomplished, the steps are designing the PowerPoint-assisted worksheet, examining the feasibility analysis, and creating questionnaire. The third stage was Development: developing the PowerPoint-assisted worksheet and carrying out the assessment. In the fourth stage, Implementation, the developed-worksheet was tested to the 6 representative students. Then, the last stage in the research, Evaluation: evaluating the worksheet based on revisions and suggestion from the media and material experts, teachers, and students.

The thing that underlies the development of this teaching material is learning that is less innovative, only relying on textbooks without any explanation of the material in which students are asked to read the material and do assignments only. This teaching material is presented in the form of PowerPoint & learning videos. The contents of the teaching material are presented following the cognitive development of children (Junaidi; 2019), namely the preparation of the material starting from the generic to the detailed, using the arrangement of teaching materials so that students find it easy to understand learning material because the material is presented clearly, briefly & interestingly, this is similar to cognitive learning theory what was conveyed by Brunner, namely that learning materials must be prepared properly and the presentation is arranged according to the level of child development. As a result, the learning materials used can enhance children's cognitive development (Abdurakhman & Rusli; 2015).

The PowerPoint-assisted worksheet is used to help students in the learning process easier. As the result, PowerPoint-assisted worksheets are designed to be as attractive as possible by attaching some images or animations and using bright colors for the text and the background slides. It also increased students' enthusiasm to learn and stimulate students' interest in the learning process. In this research, the data collections used were interviews, feasibility analysis, and questionnaires. Data collection technique is a tool to find and collect data or information (Arikunto, 2013:203). While the research tools used are interview forms, feasibility analysis forms, and questionnaires. In developing of a feasible worksheet, feasibility assessment is carried out in order to find out the feasibility. The results of the worksheet's feasibility assessment by some experts showed that the developed worksheet attained the feasibility criteria. Then, assessment was conducted to find out how practical the worksheet was. The practicality assessment obtained from students and teachers questionnaire responses. Based on the responses of students and teachers, it was found that the PowerPoint-assisted worksheet was practical. Referring to the effectiveness of product results, the worksheets not only have to be feasible but also have to be convenience to apply in learning process.

There were several advantages to create worksheet assisted by PowerPoint, they are: (1) the worksheet could be more attractive as it could attach picture, animation, and even video; (2) the teaching material could be adapted to determination, indicator, and learning objectives; (3) could display colorful worksheet in order to keep students interested; (4) the easiness of editing the worksheet, made it possible to students to write reactions in the provided-slides; (5) Microsoft PowerPoint could be easily downloaded; (6) it was accessible by teachers and students; (7) could help students to improve their mathematical problem-solving abilities. Besides the advantages, there was also a disadvantage: the internet connection was fully needed to download and send the worksheet files.

Based on some of the respondents' responses, the researcher concluded that the presentation of the LKS material was good. This LKS makes it easier for students to learn because the attractive appearance of the LKS motivates them to study with this LKS and encourages them to find more information independently. This is also OK. Based on research conducted by Priambodo & Nuryanto (2020), it is stated that if the material being developed is interesting, students will form hypotheses and will be encouraged to explore the material independently.

CONCLUSION

Based on the findings and discussions above, it could be concluded that: (1) PowerPoint-assisted worksheet in System of Linear Equations in Two Variables (SLETV) materials could advance students' mathematical problem-solving abilities in accordance with the ADDIE model of instructional design. The ADDIE model consisted of some stages that distinct, systematic, and effective; which helped the product to be well-developed and well-ordered. Not only that, it also compatible to apply in the teaching material, such as worksheet; (2) PowerPoint-assisted worksheet in System of Linear Equations in Two Variables (SLETV) materials to advance students' mathematical problem-solving abilities was confirmed as feasible, practical, and effective media to use in the learning process.

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