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Interactive PowerPoint Media Based on Problem-Based Learning on Set Material

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Abstract

The use of learning media will have an impact on increasing the motivation of students. However, the media is not the only factor determining the success of achieving learning outcomes. Learning strategies such as approaches, methods, and models will affect the success of Learning. This study aims to develop interactive PowerPoint media that utilizes problem-based Learning on the set material. This Research and Development study follows the Alessi & Trolip development model with planning, design, and development steps. At the development stage, this study only reached the alpha test stage to check media validity. Data was collected by testing the validity of the material, language, and media experts, which was carried out with the help of mathematics education lecturers and mathematics teachers at junior high schools. Data processing techniques use MSR (method of summated ratings). The validity test results by material and language experts obtained a value of 90.81%, with a very good category. It indicates that the material and language aspects of media are valid. Moreover, the media aspect validity test results in a value of 74.02%, with a good category indicating that the media is valid.

Keywords: interactive media; PowerPoint; problem-based learning

I. Introduction

Learning devices become a necessity that teachers must prepare before the implementation of the learning process (Putri et al., 2020). According to Supriharingrum's statement (in Kinasih & Risminawati, 2017), learning devices are all necessities teachers prepare before learning process activities. The learning tool is then designed to make it easier for teachers to manage learning activities in the classroom consisting of the syllabus, teaching materials, lesson plans, learning media, and assessment (Kinasih & Risminawati, 2017).

One of the learning tools that support learning activities is learning media. According to Herayanti et al. (2017), *Learning media* is a tool designed in a planned manner by teachers to transfer teaching materials to stimulate learners to learn efficiently and effectively in a conducive learning environment. Furthermore, the benefit of using media in the learning process, according to Ramli (2012), is to influence students' motivation. In line with Raharjo's opinion (in Umar, 2017) that the use of learning media that is packaged attractively can trigger the interest and motivation of students to learn so that they can understand the material provided. Ramli (2012) also argues that one of the meanings of Learning media is to provide authentic experiences for students. This experience can be given in the learning process by

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presenting problems or material in the actual form, such as through video, image, sound, or text intermediaries.

An example of learning media that can be used is PowerPoint. According to Dewi & Izzati (2020), PowerPoint has been used as a one-way (non-interactive) presentation medium, where students only act as listeners or spectators without actively participating in the learning process. Even though PowerPoint is a guided concept that is easy for teachers to use to facilitate the presentation of material consisting of pictures, sound, and even animations (De Wet in Nisrina, 2020). In addition, PowerPoint also has an advantage in its design. It consists of various templates and views that can be modified efficiently (Nisrina, 2020). PowerPoint can also allow students to communicate using hyperlinked menus (De Wet in Nisrina, 2020; Listiningsih & Aini, 2021).

However, the media is not only one of the factors determining the success of achieving learning outcomes (Herayanti et al., 2017). According to him, teachers must also pay attention to the use of learning strategies such as teaching approaches that have a significant impact, accurate methods, and appropriate learning models for achieving learning outcomes. The delivery and transfer of material can teach students to think critically, systematically, logically, and creatively and have the skills to work together in learning the concept of Learning. One way that can accommodate the achievement of this is to apply the appropriate learning tools.

The current curriculum is the 2013 curriculum. The curriculum applies a scientific approach in implementing its learning activities. This approach applies student-centered Learning (Fauziah et al., 2013). That is, students can explore and discover their own learning experiences. Permendikbud No. 22 of 2016 on Primary and Secondary Education standards states that discovery-based, problem-based, and project-based learning models should be applied to improve the scientific approach (Estitika et al., 2022). Problem-Based Learning can be one of the approaches that can be applied to Learning.

Problem-Based Learning is a learning model that applies constructivism theory (Rusman, 2016). Applying this learning model provides broad opportunities for knowledge students and solves problems based on their knowledge structure. This is in sync with Capon's statement (Murtikusuma, 2015), who said students could activate new information based on existing knowledge structures in Problem-Based Learning. Several studies conducted by Permatasari et al. (2019); Armiati et al. (2018); Yerizon et al. (2021); Arifin et al. (2019); Nalurita et al. (2019); Fitri et al. (2020), said that Problem-Based Learning helps students to develop good thinking skills, learn independently, and helps develop the ability to work together. Then according to Nupus et al. (2022), Problem-Based Learning learning activities are presented in a real context in the form of students' daily problems. These activities are structured for students to learn actively, think critically, and develop intellectual skills in problem-solving abilities.

Sets are basic mathematics materials closely related to student life (Manurung et al., 2019). However, students still often need help understanding set material. It was found that most students still got low scores in understanding the set material (Angky et al., 2011). In addition, students also often need to improve in solving set operations questions (Asnidar, 2014). Researchers also found this in schools in Tanjungpinang. Among them were observations in teaching assistance activities at the SMP Negeri 13 Tanjungpinang academic unit and interviews with one of the teachers at SMP Negeri 4 Tanjungpinang. The problems in these two schools are similar, including that student learning outcomes in learning mathematics still need to be higher, one of which also occurs in set material. This is due to the need for more student interest in learning mathematics. Some causal factors include the learning process, which is still teacher-centered, learning activities that are still minimally related to students' daily lives, learning activities that are only centered on textbooks provided by the government, and no variety of media to support learning activities.

Previous studies relevant to the research you want to do are researched by (Miswati et al., 2020) with the title "Development of Problem-Based PowerPoint Macro Learning Media on Magnitude and Measurement Materials as Learning Resources for Class X Students." The results of this study state that the problem-based Learning PowerPoint macro learning media is appropriate for use as a student learning resource. The relevance is that both use problem-based Learning PowerPoint as a student learning medium. The difference between this research and relevant studies lies in the material.

Based on the description that has been presented, this study aims to develop interactive media PowerPoint with problem-based learning models. This development fosters students' motivation to learn. It helps them understand the set material entitled "*Developing an Interactive PowerPoint Media Based on Problem-Based Learning to Improve Students' Motivation on Learning Set Material*" with valid categories.

II. Research Methods

The research used is Research and Development (R&D), which refers to the development model of Alessi & Trollip. The stages of this research include planning, design, and development (Anam, 2013). At the development stage, alpha and beta tests were carried out. However, this research only reached the alpha test stage, namely looking at the feasibility of a product with a valid category.

Before being used in Learning, an alpha test was carried out to see the feasibility of the media. Data collection in this study used expert validation instruments, including material and language validation sheets and media expert validation sheets. Trials were conducted to determine the validity of the product being developed. The media is considered appropriate if it gets a good minimum quality category. Media quality categories obtained from media data validation.

Media quality assessment data is in the form of qualitative data with a scale of 1-5. The data obtained through a validity questionnaire is in the form of qualitative data with the categories SS (Strongly Agree), S (Agree), TS (Disagree), Neither Agree Nor Disagree (C), and STS (Strongly Disagree) (Sugiyono in Hutabarat, 2022) according to Table 1

Table 1.
Expert validation calculation scale

Description
Strongly Disagree (STS)
Disagree (TS)
Neither Agree Nor Disagree (C)
Agree (S)
Strongly Agree (SS)

The data obtained from the validation sheet is qualitative. The data obtained from the assessment of experts is then converted into interval-type quantitative data using the MSR (method of summated ratings) method (Azwar, 2009). For further analysis, the researcher calculates the average score (Arikunto, 2013) using the following formula.

$$V = \frac{\sum X}{N} \times 100\ \%$$

Information:
V = the average score obtained
$\sum X$ = score obtained
N = maximum score

The values obtained from the calculations are then categorized based on Table 2. The media is valid if it at least meets the good category (Sugiyono, 2016), as presented in Table 2.

Table 2.
Validity criteria

No	Interval	Categories
1	$80\% < \bar{x} \leq 100\ \%$	Very Good
2	$60\% < \bar{x} \leq 80\ \%$	Good
3	$40\% < \bar{x} \leq 60\ \%$	Neither Good Nor Less
4	$20\% < \bar{x} \leq 40\ \%$	Less
5	$0\% < \bar{x} \leq 20\ \%$	Very Less

III. Results and Discussion

This activity is carried out in three stages: planning, design, and development. The results obtained are described as follows:

1. Planning

This research was conducted by preparing all product development needs. The activity begins with analyzing potential problems by conducting observations and interviews to analyze the characteristics of students and material. The characteristics of students are analyzed by observing and interviewing teachers and students regarding the learning process, such as the teaching and learning process, students' interests and interests during the learning process, and the use of learning support media. The material analysis is carried out by mapping basic competencies, indicators of competency achievement, and learning objectives to be achieved in the set material. Following KD, competency achievement indicators and learning objectives of the 2013 revised 2017 curriculum are shown in Table 3.

Table 3.
KD, competency achievement indicators and learning objectives

Basic competencies (KD)		**Competency Achievement Indicators (IPK)**	
3.4	Describe sets, subsets, universal sets, empty sets, and complement sets, and perform binary operations on sets using contextual problems.	3.4.1	Identify everyday problems in the form of associations and register members.
		3.4.2	Presenting the set (mentioning its members, writing down the properties it has, and notation forming the set).
Learning Objectives			
Students can identify sets in their daily lives and can present them.			

The activity was also continued by preparing everything needed in media development, namely the preparation of instruments. The preparation of material and language expert validation instruments consists of 19 statements containing a grid, as shown in Table 4 below.

Table 4.
Material and language expert validation instrument grid

No	**Aspect**	**Item Number**
1	Content Eligibility	1 – 4
2	Eligibility of Presentation	5 - 13
3	Language	14 - 17
4	Writing	18 – 19

Furthermore, the preparation of media expert validation instruments from 11 statements containing the grid is shown in Table 5 below.

Table 5.
Media expert validation instrument grid

No	**Aspect**	**Item Number**
1	Cover Design	1 – 4
2	Content Design	5 - 11

2. Design

After carrying out the define stage, the researcher then compiled the initial media design according to the results of the analysis that had been carried out. The purpose of this design is for the media to be developed in a systematic and organized manner.

Media comprises three parts: the central part, content, and cover. The components that make up the central part consist of the cover page, main menu, introduction, KD, indicators, learning objectives, instructions for use, and button information. Then the content section consists of learning materials according to the problem-based learning model, which includes activities 1) Orientation to problems, 2) Organizing students, 3) Guiding investigations, 4) Presenting work, and 5) Evaluation. Finally, the closing section consists of developer information.

Then, choosing the format or design for this interactive media includes the tutorial format presented in the instructions for using the media. Then the drill and practice formats are presented as questions or tests that train students to understand set material. Then the experimental format is presented as work steps arranged using a problem-based learning model. Then the

simulation format is presented by loading images and animations to provide virtual experiences to students. Moreover finally, the game format presented at the end of the lesson measures how students understand the set material studied.

3. Development

At this stage, the researcher then develops the media based on the results of the planning and design that has been prepared. First, researchers develop content material in the form of text, images, video, and audio. Then, the material content is compiled into Microsoft PowerPoint.

The media has been designed in this stage according to the draft prepared. Then the design results are subjected to an alpha test in the form of a product validity test involving media, material, and language experts to evaluate the content, media products, and language preparation. Assessment by experts is carried out to determine the feasibility of the product before being tested on students. The researcher made improvements according to the validator's input and suggestions. Validation will continue to be carried out until the media is said to be feasible or valid. The first improvement was made to media content. Material and language experts provide input to add picture illustrations to problem orientation activities. Then a second improvement was made to the content design. Media experts suggest adding a close icon on every page, which will be redirected to the cover media when clicked. The results of the media design that has been validated are regulated as follows.

Picture 1 contains a cover page titled 'Set,' a start icon, and instructions containing developer information. The theme taken in this media takes on natural nuances which will later be related to the initial activity, namely problem orientation. Problem orientation is presented in activities that direct students to find the concept of a set by presenting the problem of raising livestock.

Figure 1. Cover

Figure 2 has a menu consisting of an introduction, learning activities, and quizzes. A music icon can also turn on the music during learning activities using PowerPoint media. The options are in the form of buttons that, if clicked, will take you to the page listed on the button.

Figure 2. Menu

In Figure 3, the 'Introduction' button contains an introduction containing KD, competency achievement indicators, and learning objectives. Then there are instructions for using the media and information on the symbols used in this interactive media.

Figure 3. Introduction

In Figure 4, the 'Learn' button consists of learning activities according to the problem-based learning model, which contains problem-oriented

PBL syntax. This activity begins with presenting problems close to students, namely farming activities. This activity is arranged in two PowerPoint pages. The following is one page of activities guiding the investigation, as shown in Figure 4.

Figure 4. Problem orientation

The next activity is organizing students. Activities are presented with questions to ensure students have understood the questions presented before and direct students to ask the teacher if they need help understanding the questions. Then students are asked to form groups with the help of the teacher.

Then in Figure 5, there are activities guiding the investigation. This activity asks students to carry out investigations by answering the questions presented. This activity is organized into three PowerPoint pages. The following is one page of activities guiding the investigation, as shown in Figure 5.

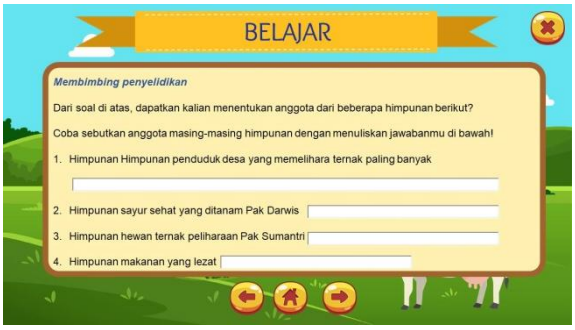

Figure 5. Guiding research

In Figure 6, there is an activity for presenting the work. This activity asks students to present the results they have obtained in front of the class with the teacher's guidance.

Figure 6. Presenting the work

In Figure 7, there is an evaluation activity. In this activity, students are asked to write back the results of their answers neatly.

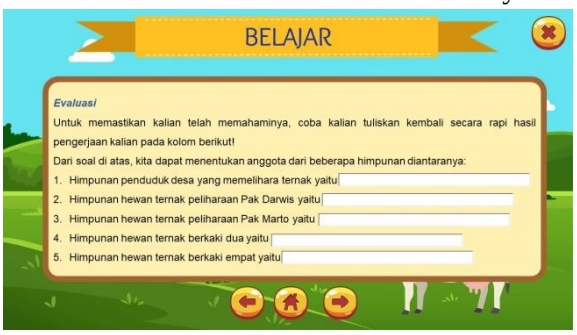

Figure 7. Evaluation

In Figure 8, the 'Quiz' button on the slide menu contains activities to guide students to try and see students understanding of the set material.

Figure 8. Quiz

The last page is developer information, which is the closing menu for learning activities which contains information on the developer's name, institution, and email.

Furthermore, the results of the accumulated assessment of the two validators for the media are described as follows:

1) Expert validation of materials and languages

Testing the validity of material and language experts is assisted by mathematics

education lecturers and subject mathematics teachers by providing validation sheet instruments. Table 6 shows the results obtained from the validation of material and language experts with a percentage value of 90.81% in the very good category so that the product in terms of material and language is declared valid.

Table 6.
Material and language expert validation results

No	Aspect	Score
1	Content Eligibility	36
2	Eligibility of Presentation	88
3	Language	43
4	Writing	25
Total Number of Scores		192
Average (%)		90.81
Categories		Very Good

2) Media Expert Validation

Two mathematics teachers conducted the validity test of media experts. After the assessment, the researcher made improvements based on the validator's suggestions until the media was declared suitable for use by students. Table 7 shows the results obtained from the validation of media experts with a percentage value of 74.02% in the good category, so the product in terms of media is said to be valid. The average percentage of the two corresponding assessments was 82,41%, which indicates that the validity of Interactive PowerPoint Media Based on Problem-Based Learning on Set Material is very good.

Table 7.
Media expert validation results

No	Aspect	Score
1	Cover Design	36
2	Content Design	63
Total Number of Scores		99
Average (%)		74.02
Categories		Good

Based on the above explanation, the study results indicate that researchers have successfully developed interactive media based on problem-based Learning on the set material with valid eligibility. The results of this study reinforce the results of research conducted by Tambunan et al. (2021). They developed media through learning videos that apply Problem-Based Learning to achieve maximum learning outcomes. It is proven by the products it has developed to achieve effectiveness. However, the media's ease of use is also a consideration by researchers. The ease of using the media will allow the teacher to provide media to support the learning process. So, the researchers considered that the media used is PowerPoint because of its ease of use. Several studies conducted by Zahra et al. (2021), Dewi & Izzati (2020), and Gulo & Harefa (2022) also developed PowerPoint media with consideration of the ease of use of media by teachers by utilizing various available templates and features.

Various features, as well as *a template*, can be used to produce media that is interesting for students. This aligns with (Nisrina's opinion, 2020) that PowerPoint media has the advantage of ease of use by teachers with various types *of templates. The* available ones can be utilized and replaced easily.

Interactive PowerPoint learning media can be an alternative that teachers can use to facilitate the delivery of teaching materials to students. The use of interactive PowerPoint media can increase motivation, student learning activity, and student learning achievement (Yuliansah, 2019). Then it is hoped that in the future, media development will also consider using appropriate learning models to achieve learning objectives optimally.

IV. Conclusion

The results of this study can be stated that the researcher succeeded in developing an interactive PowerPoint media based on problem-based Learning on set material that is valid. The development process is carried out by conducting definitions with an analysis of the characteristics of students and material by conducting interviews, KD formulation, indicators of intention, and media development goals. Then proceed with the design stage with the

arrangement of instruments and the selection of formats or designs. Finally, do development, namely developing media and conducting validity tests to assess product feasibility.

Material experts obtained the validity test results, and the proportion of language scores was 90.81%, with a very good category indicating that the media was declared valid. In comparison, the results of the validity test by the media obtained a proportion value of 74.02%, with a good category indicating that the media was declared valid. Overall, the validity of Interactive PowerPoint Media Based on Problem-Based Learning on Set Material is in the very good category, with an average percentage was 82,41%.

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