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# The development of a learning media using motion paths in the circle learning material

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**Abstract.** Motion paths animation in Microsoft PowerPoint has the function of giving animation effects to objects so that the objects move based on the paths that are previously made. This study aims to describe the steps in developing a learning media using motion path animation in the circle learning material. The media development used the ADDIE model, which consisted of five stages: analysis, design, Development, Implementation, and Evaluation. Media validation was carried out by media experts and learning experts. The small group trial was conducted on two students, while the large group trial was conducted on 20 students at a private junior high school in Pasuruan. Based on instrument validation results by learning experts and media experts, the average score was 4.15 (a very valid category). Based on the small group trial and the large group trial, the result was 3.6 and 3.77. The results show that the learning media using motion path animation on circle material is worthy for use in learning.

## 1. Introduction

Circle is important in our everyday life. We often encounter and use objects with a circular surface in our everyday life, such as clocks and coins. By knowing the surface area of the clock, we can calculate the amount of paint needed to paint the surface of the clock. The surface of a coin that we use to shop is a circle. To make coins, one must know the surface area of the coin. Each wheel of a motorcycle is also a circle. To calculate the length of the trajectory when driving a motorcycle, one must know the circumference and the number of turns of the wheel. Learning circle material requires direct investigation by students themselves [1]. However, in reality, the understanding of the concept of circles is still low.

Students need to understand the concept of a circle as early as possible. Elementary school students should know the circle, even though it is limited to introducing its forms and elements. Junior high school students should familiar with the definitions, tangents, and sections of a circle. Senior high school students should recognize the equations and tangents of a circle and its relationships with



space. However, in reality, students consider the circle learning material difficult [2]. Students still have difficulty in understanding the mathematics concept [3, 4, 5].

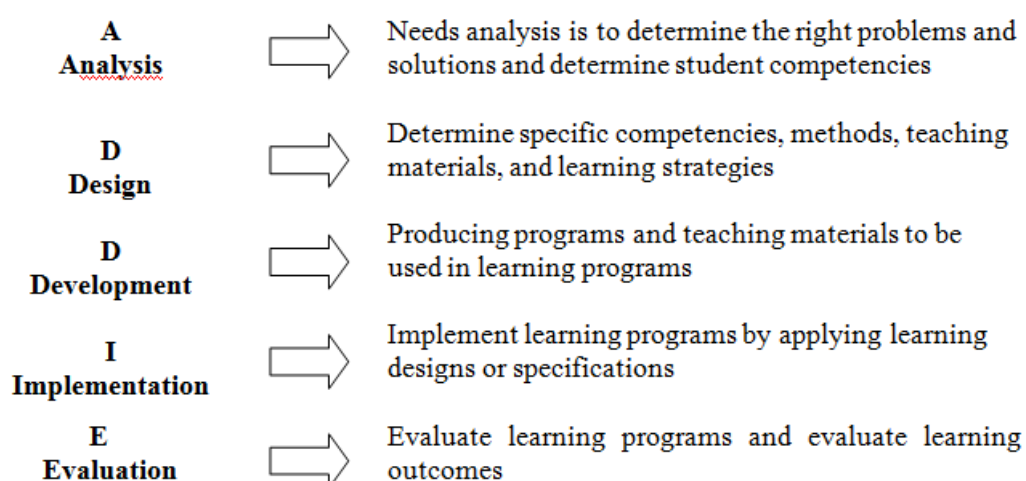
The researchers conducted an observation related to the students' difficulties in circle material on Grade 8 students of a particular junior high school in Pasuruan. The results of the preliminary observation were as follows: a) Students who achieved minimum completeness criteria values in circle learning material were as many as 55% or 11 out of 20 students; b) Circle material learning was using PowerPoint media but limited to the delivery of material in the form of slides/pages, and c) The students were less active in the class because they only listened to the material displayed by the teacher through slides (PowerPoint).

The difficulty faced by students when studying circles depends on the media being used to understand the concepts. Based on previous research, the use of PowerPoint media with Visual Basic for Application showed a potential effect on student learning outcomes and positive attitudes [6]. The development of interactive multimedia-based learning media can help students learn independently to develop their mathematical problem solving and understanding skills [7]. Computer-assisted learning with the Lectora Authoring Tools can improve Grade 8 students' learning outcomes in geometry [8]. GeoGebra enables students to explore the relationship of the radius of a circle [9]. Research [10] used Visual Basic Macro on Microsoft PowerPoint to make simulation diagrams. In reality, the teacher's ability to make learning media is still on average [11]. Based on the researchers' preliminary observation and previous research results, the researchers of this research are interested in developing mathematics learning media using animated motion path in the circle learning material.

## 2. Method

This research is a research and development (R & D). The development of educational products is related to textbooks, film instructional, and computer software and methods such as teaching and educational programs [12]. This development research product is a learning media in circle material using animated motion path in PowerPoint.

The development of the mathematics learning media adapted the ADDIE model, which consisted of 5 stages: analysis, design, development, implementation, and evaluation [13, 14]. In this research, only three stages were adapted due to time constraints. The ADDIE model was chosen because of its continuous steps. The design of the ADDIE model in this study follows the procedure performed by [15].



**Figure 1.** ADDIE model [15]

The analysis stage consists of curriculum, student character, and media development analysis. Analysis of students' abilities was done to optimize the use of the learning media [16]. The applicable curriculum was the K-13 curriculum. The objects analyzed in the curriculum were the core

competencies, essential competencies, and indicators. Analysis of the junior high school students' characters was based on relevant theories, dialogue with the junior high school teachers, and observations during learning. The results of student character analysis served as guidelines for developing the learning media. Analysis of media development was carried out by examining theories about the development of PowerPoint-based media.

In the design stage, the researchers used a reference book about circle material. It began with selecting titles, indicators to be achieved, and making evaluation tools in the form of games. After completing the design, the researcher compiled an assessment instrument. The assessment instrument must be validated before use. Instrument assessment was carried out by learning experts and media experts. The instrument was compiled so that the media being developed became genuinely valid.

In the development stage, the development was carried out based on the eligibility requirements using soft files containing circle material with animated motion path and questions in the form of a game. Furthermore, the development of assessment instruments and student response questionnaires was carried out. The final activity of the development stage was the expert validation in which the small group trial consisted of two students and the large group trial consisted of twenty students. Students were required to answer several questions after using animated motion path media and filled out the students' response questionnaire.

The data obtained from this research were in the form of quantitative and qualitative data that would be analyzed descriptively. Quantitative data was used to determine validity and worthiness, whereas qualitative data was used to describe things that need to be revised from the media being developed.

**Table 1.** Description of validation category score from the expert (adapted from [17]).

Final Score	Category
0.0 – 1.0	Invalid
1.1 – 2.0	Less Invalid
2.1 – 3.0	Valid Enough
3.1 – 4.0	Valid
4.1 – 5.0	Very Valid

**Table 2.** Description of worthy category from the students (adapted from [17]).

Final Score	Category
0.0 – 1.0	Not Worthy
1.1 – 2.0	Less Worthy
2.1 – 3.0	Worthy Enough
3.1 – 4.0	Worthy
4.1 – 5.0	Very Worthy

Development of the learning media using animated motion path was said to be successful when meeting the following criteria: a) Reaching at least a valid category, indicated by the minimum average score of the validator of 3.1; and b) Reaching at least the worthy category, indicated by the minimum average score of the validator of 3.1 [17].

### 3. Result and Discussion

The initial appearance of the learning media can be seen in Figure 2. below.



**Figure 2.** Initial display of learning media.

The menu on the learning media is divided into two parts (Figure 3). The first part consists of Basic Competencies, Circle, and Exit. The Basic Competencies menu contains the essential competencies to be achieved in using the media. The Circle menu contains examples of circles in everyday life, such as elements, circumference, and circle area. The second part consists of Circle Game, Caption, Rules, and Score. The circle Game menu contains games about circle material. The Caption menu contains information from the symbols contained in the Circle Game. The Rules menu contains instructions for using the Circle Game. The Score menu contains the final score after working on the Circle Game.



**Figure 3.** Menu in the circle game.

Validation of learning media instruments was carried out by media and learning experts. Expert validation was carried out before applying the media to students [18]. Assessment from learning experts can be seen in Table 3 below.

**Table 3.** Assessment of learning expert (adapted from [19]).

Assessed Aspects	Score				
	1	2	3	4	5
<i>Aspects of learning design</i>					
a. Clarity of learning objectives				√	
b. The relevance of learning objectives with Core Competencies/Basic Competencies/Curriculum				√	
c. Suitability of the material with Core Competencies/Basic Competencies/Curriculum					√
d. The systematic, coherent, clear logic flow				√	
e. Clarity of description, discussion, examples, simulations, exercises			√		
f. Consistency of evaluation with learning objectives				√	
<i>Content</i>					
a. Conformity with the truth of the concept.					√
b. Challenging students' intellectuality and stimulating student curiosity.					√
c. Ease the students to understand material concepts.				√	
d. Challenging students' intellectuality and stimulating students' curiosity.					√
e. Students can work with diverse knowledge and experience.					√
<i>Language</i>					
a. Using good and right Indonesian					√
b. Using communicative language				√	
c. Using language that is easily understood by students					√
d. Using clear language so that it does not cause multiple interpretations				√	
The average value of learning expert				4.4	

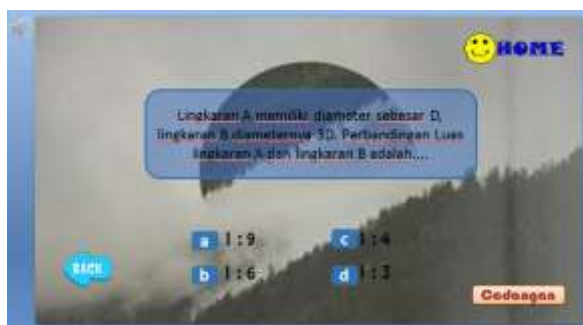
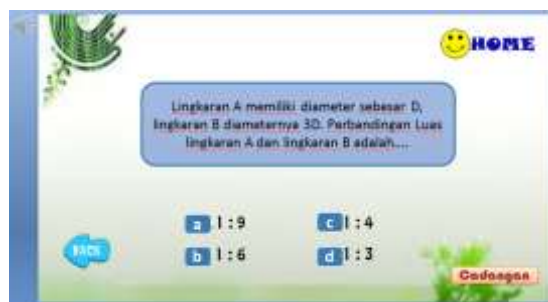
Based on Table 3. The score obtained by the learning expert was 4.4. Learning experts provide revisions to clarify the purpose of the question (see Figure 4). While the assessment from the media experts is in Table 4.

**Figure 4a.** Problem before revision.**Figure 4b.** Problem after revision.

**Table 4.** Assessment from media expert.

Assessed Aspects	Score				
	1	2	3	4	5
<i>Material</i>					
a. Mathematical learning media using Motion Path Animation is in accordance with the learning material.				√	
b. Mathematical learning media using Motion Paths Animations is in accordance with the learning objectives.				√	
c. Mathematical learning media using Motion Animation is in accordance with Basic Competencies.				√	
<i>Visual</i>					
a. Mathematical learning media using Motion Animation can provide illustrations that are appropriate to the actual situation.			√		
b. Mathematical learning media using Motion Animation can facilitate students in imagining things.				√	
<i>Audio-Visual Communication</i>					
a. Creative in making ideas			√		
b. Visual (layout design, typography, use of music)				√	
c. Use of mobile media (animation, simulation)				√	
<i>Benefit</i>					
a. Can be used as a guide for teachers in learning to facilitate students to understand the concept of a circle				√	
b. Can change teacher-centered learning habits to be focused on students				√	
The average value of learning experts				3.9	

The average score of the media experts is 3.9. Media experts provide revisions to the learning media background (Figure 5). The media expert suggested dark background for bright-colored writing and bright background for dark-colored writing.

**Figure 5a.** Background media before revision.**Figure 5b.** Background media after revision.

Based on the validation of learning expert and media expert, the results are as shown in Table 5 below.

**Table 5.** The average result of experts' validation.

Validator	Score
Learning Expert	4.4
Media Expert	3.9
Average	4.15



The average validation result was 4.15, or in other words, the media was very valid so that it can be used for trial/testing.

The trial was conducted in a small group of two class VIII students. A small group trial using a student response questionnaire showed an average result of 3.6; that is, the media was considered worthy of using. Some students commented that the sound of music was too loud to be used as a basis for improving learning media. Then the researcher revised the media audio, namely by reducing the volume so as not to disturb students' concentration when working on games in the form of circle questions. After a small group trial, a large group trial was conducted on 20 students at a junior high school in Pasuruan. The atmosphere of a large group trial when filling out the student response questionnaire can be seen in Figure 6 below.



**Figure 6.** Large group trial.

The result of a large group trial using student response questionnaires showed an average result of 3.77; that is, the media was considered worthy of using. In general, the students stated that the learning process using media with motion path animations was interesting. They understand the material better after participating in the learning using animated media motion paths equipped with audio. This is in line with other studies stating that e-learning using audio media enabled students to better understand the learning material [20].

#### **4. Conclusion**

In this research, a motion path learning media in the circle material under the ADDIE model (Analysis, Design, Develop, Implement, and Evaluate) has been developed. This research was only carried out up to the development stage, which involved a trial on 20 students in Pasuruan due to limited time related to the learning schedule. Based on learning and media expert validation, the media was said to be very valid to be used on a test, trial, or learning process. The trial results of the small group and large group show that the media is worthy of use. This media is recommended to facilitate teachers in providing online learning.

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