

# *Interactive Multimedia in Learning 2-Dimensional Geometric Shapes in Elementary School*

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**Abstract—** Geometry is a branch of mathematics that occupies a special position in learning mathematics in schools. The importance of the concepts contained therein places geometry in relatively large proportions in the curriculum. A two-dimensional geometric shape is a flat plane shape that has two dimensions. It is a flat area that is bounded by straight or curved lines. Geometry has several different calculation formulas and some of the two-dimensional geometric shapes are known as square, rectangle, triangle, trapezoid, parallelogram, kite, rhombus and circle. The problem is how to apply a learning method or media that is enjoyable supporting by an interesting visualization. The choice can be an application that can be done with interactive learning multimedia so that students can easily understand geometry and fosters students' interest in learning mathematics.

**Keywords—** interactive multimedia, geometry

## I. INTRODUCTION

Geometry is one of the three main domains of mathematics, and it is taught since in the first grade of elementary school. This is stated in *Permendikbud* number 21 of 2016 concerning the content of mathematics subjects consisting of three main domains, namely natural numbers and basic fractions, basic geometry and measurements, and basic statistics. Geometry can be seen as a mathematical system that presents abstract phenomena, but in learning it can be taught to students steps by steps in accordance to the stages of child development. Geometry is a branch of mathematics in which visualization is one of the most important elements for understanding definitions and theorems, as well as for solving given tasks and problems (Milovanovik, 2013) [7]. Kennedy and Tipps (1994) [5] stated that learning geometry can develop students' problem-solving abilities and support other topics in mathematics.

The reality at school shows that geometry is one of the mathematics domains that is considered difficult by students. (Batista & Borrow, 1997; Elchuck, 1992; Noraini, 1999; in Idris, 2009) [4] revealed that students; low geometry achievement

were caused by several factors including the lack of understanding in learning geometry that many students failed to develop an adequate understanding of geometrical concepts, geometrical reasoning, and the ability to solve geometry problems. Selection of learning strategies that are less precise and less attention to students' geometrical thinking skills is also a factor for students' low geometric achievement (Safrina et al, 2014) [10]. Many teachers also do not understand the characteristics of the geometry thinking. By understanding students' geometrical thinking characteristics based on van Hiele's levels, it is expected that teachers are able to apply learning methods that are appropriate to the characteristics of every student as revealed by Muhassanah (2014) [6]. In addition, many students learn to memorize geometrical concepts more than constructing their own knowledge (Aydoğdu, 2014) [1].

Based on an interview with an elementary school teacher about learning geometry so far in her classroom, the teacher states that the learning geometry follows the traditional teaching model in which the teacher begins to explain concepts/procedures and gives examples, and then follows by some exercises in which the students do the exercises in accordance to the examples. The teacher uses the textbooks provided by the government without considering how the geometry should be taught. For the instructional media, the teacher only uses limited objects in the classroom and move to abstract mathematics.

Good learning can be supported by a conducive learning atmosphere and active communication between teachers and students. Departing from this, interactive multimedia in the classroom is developed on the basis of the assumption that the communication process in learning would be more meaningful (attracting students' interests and providing convenience to understand the material due to its interactive presentation) if utilizing various media as a means of supporting learning (Didik, 2009)..

Interactive multimedia is a multimedia display that is designed so that the display fulfills the function of informing messages and having interactivity with its users (Munir 2012:110) [8]. Costantinescu (2007) [2] argues that multimedia refers to computer-based systems that use various types of contents such as text, audio, video, graphics, animation, and interactivity. Furthermore, Purwanto (2004: 6) [10] suggests that teachers should use interactive multimedia in learning because it can optimize the role of the senses in receiving information into the memory system, so that it can be relatively more effective in building students' understanding structures. So, the interactive multimedia in this study means a concept in the field of computer technology where components such as text, images, animations and videos are combined into one to be presented interactively. The interactive multimedia in learning 2-dimensional geometric shapes is needed as a way to overcome the low interest of students in learning mathematics, especially geometry.

## II. METHODS

The stages of the research and development of the interactive multimedia learning model of 2-dimensional geometric shapes are as follows:

### A. Analysis

At this stage, the researchers define the topics of 2-dimensional geometric shapes to be investigated namely, square, rectangular, triangular, trapezoidal, parallelogram, kite, rhombus, and circle. To have an overall understanding of those topics, we conduct an interview with a teacher about the current learning system, so it is expected to get a system that is a unified whole and as expected.

### B. Design

The design stage begins with determining what operating system is being used. Besides, we also look for the software, the hardware, identification of learning objectives, story board planning and learning content, and the media.

### C. Development

In the development stage, the multimedia is developed using various software, including Adobe Flash CS6 from Adobe Corporation as an animation-making software and Adobe Photoshop as image processing software, specifically vector. This stage starts from making various animations that are needed in accordance with the story board. Then we create an interface that is used as a display frame, and then the display background and the images needed using Adobe Photoshop.

### D. Evaluation

In this stage, we evaluate software engineering using the white box method to find out the function of all navigation, hypertext and hyperlink. The multimedia was testing to some users to find out whether the nteractive multimedia of 2-dimensional geometric shapes is feasible or not.

## III. RESULTS AND DISCUSSION

The main results of this study are an interactive multimedia CD and a media guidebook, as seen in figure 1.



Figure 1. The interactive multimedia CD and the media guidebook

Based on the analysis of the system, an interactive learning multimedia was developed whose general functionality can be seen in figures 2 to 8.

### A. The Introduction Section

The introduction section is an animation that appears when the interactive learning multimedia runs, and it can be seen in figure 2.

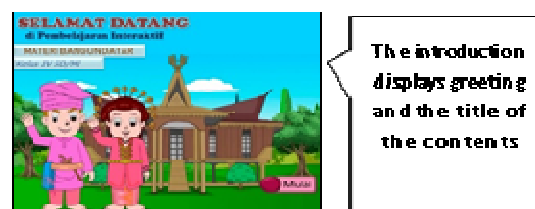


Figure 2. The display of the multimedia introduction of 2-dimensional geometric shapes

### B. Instructions for Use of Interactive Multimedia

Before students use this interactive multimedia, they must understand the instructions for using it. Figure 3 presents the display of the instructions for using the interactive multimedia.

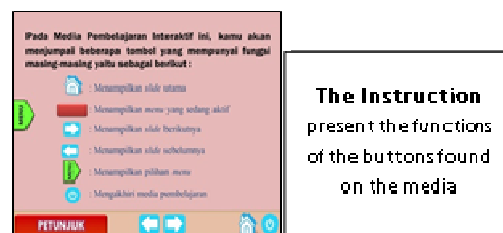


Figure 3. The media instruction

C. *The Menu of Learning 2-Dimensional Shapes*

The menu is used to present the topics or activities that can be chosen. It contains five topics and one of them is related to the learning 2-dimensional shapes (Figure 4).

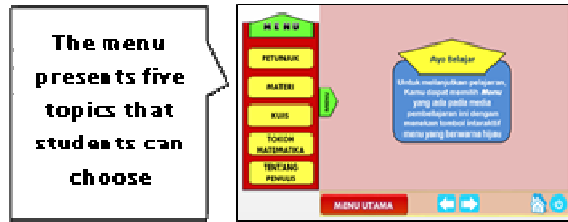


Figure 4. The display of the main menu of the interactive learning multimedia.

D. *The Display of the Mathematical Contents of 2-Dimensional Geometric Shapes*

The display of the mathematical contents presents the information of a list of 2-dimensional geometric shapes that students can choose (Figure 5).



Figure 5. The display of the mathematical contents

E. *The Display of a Specific Content, Square*

The display of a specific content, in this case square, is used to explain all properties related to square. It includes the properties and prove of the formula (Figure 6).



Figure 6. The display of the square properties and prove of the formula

F. *The Display Of Quiz Or Exercises*

Quiz is information that can be used by students to test their knowledge about 2-dimensional geometric shapes. If students can answer a question correctly, they can see the explanation of their answers, but if the students answer incorrectly, the display will return to the concept. Figure 7 presents

the display of a question and the discussion of the answer. Figure 7. The display of a question and the discussion of the answer

G. *The Display of Geometers*

In this section, some geometers are introduced to students in order to motivate them to learn 2-dimensional geometric shapes. Figure 8 presents some of them



Figure 8. The geometers

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