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Two-dimensional interactive media for fourth grade students

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Abstract. The use of advanced technology as instructional media can facilitate students' understanding about instructional materials. The purpose of this research is to develop two-dimensional interactive media for fourth grade students. To this end, this study employed Thiagarajan's Four-D (Define, Design, Develop, and Disseminate) model. Data were analyzed descriptively, both qualitatively and quantitatively. Data analysis was performed using qualitative and quantitative descriptive data analysis techniques. The results revealed that two-dimensional interactive media was deemed valid by experts with an average score of 4.5 and applicable for teaching elementary school students. Elementary students responded positively to the use of the interactive media and their understanding about two-dimensional instructional materials improved.

1. Introduction

Mathematics instruction is a process of providing students with learning experience through a series of planned activities to facilitate their understanding about instructional materials [1]. Mathematics is not a matter of memorization [2], but it is more like logical, analytical, systematic, critical and creative reasoning [3]. Geometry is an interesting topic [4], one of whose materials is two-dimensional figures. In practice, students are taught about two-dimensional geometric concept by way of memorizing formulas [5]. Therefore, it is necessary to develop a fun mathematics instructional method to better facilitate students' understanding.

Current rapid technological developments have influence on educational practices [6]. Computers are used not only for administrative affairs, but also as instructional media [7]. Instructional media is anything used to convey information effectively and efficiently in instructional activities [7]. The selection of instructional media may influence the achievement of instructional objectives.

Interactive multimedia is one of instructional media that utilize computer technology [8]. The interactive media in this study was developed using PowerPoint. It consisted of images, audios, and animations to facilitate students' understanding about instructional materials [9]. The use of interactive media in mathematics instruction is one way to facilitate students' understanding by way of visualizing abstract mathematical materials [10].



2. Method

This research is a Research and Development adopting Thiagarajan's Four-D development model [11] as illustrated in Figure 1.

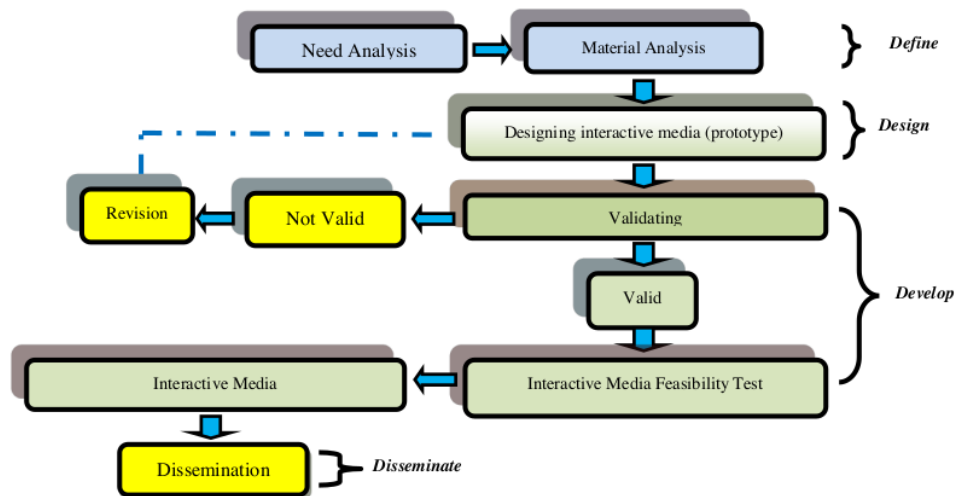


Figure 1. Development procedure of two-dimensional module.

Figure 1 shows that there were four development phases: (1) Define: this phase determined instructional needs by analyzing objectives and materials; (2) Design: this is where the interactive media prototype was designed; (3) Develop: this is the development phase where interactive media was developed and revised based on expert suggestions; and (4) Disseminate: this phase tried out the effectiveness of the use of instructional media in instructional activities.

Data collection instruments included: validation sheet, questionnaire, observation sheet, and students' post-test. There were two types of data in this research: (a) qualitative data including suggestions, criticisms, responses, and recommendations from validators, and (b) quantitative data the results of interactive media validation and students' post-test.

3. Results and discussion

3.1. Two-dimensional interactive media

The interactive media was designed using PowerPoint and consisted of videos, animations, texts, sounds, and graphics. It displayed moving 2D forms, so students would be interested [12]. The e-module comprised square, rectangle, triangle, trapezoid, parallelogram, rhombus and kite. What follows is the design of PowerPoint-based interactive media.

Table 1. PowerPoint-based interactive media design.



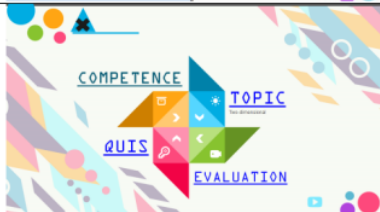
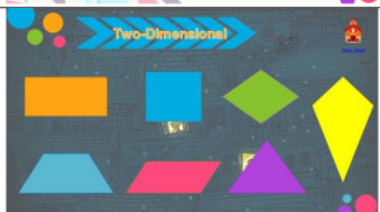
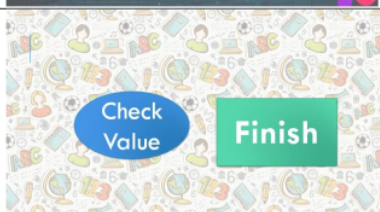
No	Component	Image
1.	Starting Page	
2.	Instructions	
3.	Main Menu	
4.	Two-Dimensional Figures	
5.	Check Score	

Table 1 outlines the main elements of the two-dimensional interactive media. On the initial displays, there are using instructions and main menu comprising instructional materials, quiz, and test items. On “Material” page, there are 7 types of two-dimensional figures to choose from. “Material” page also presents formulas for two dimensional figures to help students visualize abstract mathematical concepts [10]. This interactive media can encourage students to be independent learners and help them develop their mathematical abilities [13]. This interactive media also features quizzes to evaluate students’ learning achievement [14] in accordance with their own abilities [15]. Students can check their scores by themselves.

3.2. Result of interactive media feasibility test

The feasibility data of interactive media were obtained from the validation of experts on media, material and language. The data were both quantitative and qualitative. Quantitative data were used to determine the feasibility of the interactive media. And qualitative data were expert suggestions, used to revise the interactive media prototype design. Table 2 presents the result of interactive media component feasibility test analysis.

Table 2. Result of e-module component feasibility analysis.

No.	Component	Percentage	Criteria
1.	Feasibility of Content	90 %	Highly valid
2.	Feasibility of Presentation	85 %	Valid
3.	Feasibility of Language	90 %	Highly Valid

Table 2 shows that the feasibility of presentation has the lowest percentage. This is due to the fact that the interactive media was in the “Develop” phase. The average percentage of all components is 88%, meaning that the interactive media is valid and thus feasible for use in elementary schools. Previously, interactive media was developed for use in biology class [16].

3.3. Result of trial

The result of trial use of the interactive media in an elementary school in Malang shows that the use of the developed interactive media received positive responses from students as much as 92%. This goes to say that the use of interactive media can enhance students’ learning interests [17,18]. The use of the interactive media also facilitated students’ understanding about instructional materials on two-dimensional figures indicated by scores of quizzes.

4. Conclusion

Based on the average validation score of 90%, the developed interactive media is feasible for use in elementary schools. The interactive media can help teachers deliver instructional materials on two-dimensional geometric figures. Students responded positively to the use of interactive media as it facilitated their understanding about instructional materials. However, the interactive media needs further development for other mathematical topics so as to improve instructional process quality. Thank you to Ministry of Research, Technology and Higher Education of the Republic of Indonesia for funding this research.

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