

Development of Digital Plane Shape Houses Media for Class IV Elementary Schools

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ABSTRACT

Based on the results of observations at SDN Bumiayu 3 Malang it was found that the teacher had used concrete media and LCD projectors in conveying the concept of a plane shape figure. The results of interviews with teachers showed that even though they had used the media, there were still many students who were confused and forgot about the plane shape material. Based on interviews with students also showed that students prefer to be involved in the use of instructional media. The use of media that has been used by teachers has not been able to provide students with an understanding of the concept of two-dimensional shapes. This study aims to develop media products in the form of miniature houses called digital plane shape house media for valid and attractive grade IV elementary schools. There are 4 components in the digital plane shape media, namely model media, learning videos, snakes and ladders math games, and user manuals. This media is equipped with learning videos. The research method is Research & Development (R&D) used model of Dick & Carey. Based on formative evaluations by media experts obtained 86.87%. From material experts obtained 94.64%. From trials to teachers obtained 96.7%. Trials to students gained 95.27%. Based on the acquisition, the percentage shows that the digital plane shape house media is valid and interesting so that it can be used in learning in grade IV in primary schools.

Keywords: Learning Media, Digital Plane Shape Houses Media, Grade IV Elementary School

1. INTRODUCTION

Mathematics is an abstract science that can't be separated from human life. Mathematics is one of the sciences that is often found in daily activities, the example in number, date, buy and sell activities, measure an object, etc. Mathematics is a well-organized and structured science. This is relevant to Noer's opinion (2017) that mathematics has a concept that starts from the simplest to complex with a structured, systematic, and logical arrangement. Mathematics is applied from Elementary School to College and even in working. Mathematics is not only about counting skills but also has an important role to make the quality of students by thinking critically in dealing with problems and solving problems correctly. According to Barus (2018) that learning mathematics is learning ideas and structures so that can change someone's behavior, for example, to change behavior from those who don't know to know.

Learning mathematics in elementary schools requires an understanding of mathematical concepts. One of the mathematical concepts that are often found in life is the

concept of geometry. Geometry is material about space and all the components that make space (Yuza, 2018). Understanding the concept of two-dimensional shape becomes the basic material before moving on to higher geometry. The two-dimensional shape is mentioned concrete objects that are often shown by the students. To minimize multiple interpretations, difficulty understanding, or even shadows, in teaching the two-dimensional shape, it is necessary to have concrete objects or images that can represent these two-dimensional shapes. According to Kristanti (2014), a math teacher must make facts, concepts, operations, or principles in mathematics that are visible to children's thinking. Therefore, teachers have an important role in teaching mathematics.

Learning media becomes a tool in giving students the concept of two-dimensional shapes so that the material being taught can be understood easily. This is because elementary school age is included in the concrete operational age which was children still need media to understand abstract things. This is relevant to the opinion

of Yuza (2018) that elementary school age can formulate their definitions accurately and master various symbols or something abstract, they only can remember the definitions that have been studied and then explain them again. Students will find it easier to understand the concept when using sensory tools such as seeing, hearing, feeling according to the characteristics of elementary school students. This is relevant to Arsyad's (2016: 11) opinion that students should be asked to use all their sensory tools so that the learning process can be successful.

Media is also known as a tool to clarify the material being taught. Besides that, according to Wijayanti (2018), the media can overcome the limitations of student learning experiences, limited space, and create a direct interaction between students and their environment. At school, students are also faced with a subject that is abstract or complex so that sometimes it is difficult to understand if it is only using words without the presence of media. This is relevant to the opinion of Asyhar (2012: 29) that learning media can help teachers in facilitating the learning process, clarifying material with various concrete examples, facilitating students and teachers to interact, and even providing practical opportunities for students with learning media. Use media not only helps students understand the concept but can attract students' attention so that motivation and enthusiasm in learning will appear to the students.

Based on observations at SDN Bumiayu 3 Malang, it was found that the teacher had used the media of concrete objects in the classroom and LCD projectors to convey the concept of a two-dimensional shape. The results of the interview showed that many students were confused and forgot about the two-dimensional shape's material, for example, the use of the formula for the periphery and area of the shape as well also less motivation of the students. The interview results with students, it knows they like to participate using the learning media.

Based on the explanation above, the media that have been used by the teacher are still not able to help students to understand the concept of two-dimensional shape, using formulas according to the context besides applying them in everyday life. Therefore, it needs other alternatives in the use of learning media that can attract students' attention to make it easier to understand and invite students to be active in learning. The development of digital technology that is growing rapidly nowadays can also be integrated into learning media. So, teachers need to develop the learning media for learning materials that according to learning needs, student characteristics, and times.

One of the learning media that can be used in learning the concept of two-dimensional shape is the digital two-dimensional house media. This learning media is a miniature house. In this media, there are 4 parts of the house, namely the dining room, bedroom, living room,

and family room. Each part of the house has furniture that represents a two-dimensional shape that students can see, hold, and measure. This media is completed with a learning video that contains an explanation of the two-dimensional shape material that uses digital technology in the form of a QR Code. QR Code is an evolution from a barcode that was originally one-dimensional to two-dimensional and contains information from both vertical and horizontal directions (Yahya & Bakri, 2019). The advantage of the QR Code is that it can provide information quickly and get quick responses too. Also, the QR Code has a large storage capacity.

Based on the findings of the problems and several studies that have been described above, the researcher will conduct research and development of mathematics learning media with miniature houses with plane shape material for grade IV elementary schools. The difference with previous research is that the researcher uses more two-dimensional shapes, not just rectangles, squares, and triangles. Also, this media development with digital technology in the form of the use of QR codes which contain learning videos for plane shape materials.

The previous research was conducted by Hendratni (2016), which is related to the development of plane shape houses media based on miniature houses designed for assembling and assembling. The results of this study indicate that the media that has been developed is suitable for use. Obtaining assessments from material experts and media experts received good criteria.

Also, the development of this media helps students in learning, increases students' motivation and curiosity, provides independent learning opportunities for students, is easy for students to use, and has a positive impact on students because it can improve student achievement. Relevant research was also conducted by Afyah (2018) with the results of the research that the Lukata Board media with the circumference and area of a plane shape for grade IV SD students produced was valid, effective, and interesting.

Research on development by utilizing technology was also carried out by Asnur, et al (2018), namely the use of the QR Code as a learning medium. The results showed that the learning process using QR Code had a positive impact on improving the learning process. The results of this study are very relevant in learning, especially in increasing students' motivation to learn foreign languages in tertiary institutions.

Based on the explanation stated above, research will be carried out through research and development with the title "Development of Digital Plane Shape Houses Media for Class IV Elementary Schools". The purpose of this research is to produce learning media for digital plane shape houses media that are valid and attractive so that they can be used in learning.

2. METHODS

The method used in this research is Research and Development with the Dick & Carey model. The Dick & Carey model has 10 stages but the steps are modified by the researcher according to the needs in developing digital plane shape houses media. The results of the modification of the stages carried out by the researcher were: 1) needs and objectives analysis, (2) learning analysis, (3) learner analysis and context analysis, (4) developing instruments, (5) developing learning strategies, (6) developing products, (7) designing and conducting formative evaluations and product revisions, (8) conducting trials, (9) revising products, and (10) final products. The trial subjects in this research and development consisted of media experts, material experts, product users, namely teachers and grade IV students at SDN Bumiayu 3 Malang.

The type of data used is qualitative data obtained from interviews, the results of criticism and suggestions from experts and users, and quantitative data obtained from questionnaires in the form of numbers as a form of scoring. The data collection instruments used observation, interviews, and questionnaires. Observations were made at the beginning of the study to determine problems in schools related to learning media and during product trials with students. Interviews were conducted with teachers and students using a semistructured interview type. The questionnaire used is a type of open and closed questionnaire to determine the validity assessment, criticism, and suggestions contained in products from media experts.

The data analysis techniques used are qualitative data analysis techniques and quantitative data analysis techniques. Qualitative data in the form of student responses, criticism, and suggestions included in a questionnaire from experts and users using qualitative descriptive analysis techniques. Quantitative data analysis is obtained from a questionnaire which will be analyzed by calculating the percentage using a formula adapted from Akbar (2013: 83) as follows.

$$V\text{-ah} = \frac{T\text{Se}}{T\text{Sh}} \times 100 \% \quad (1)$$

$$V\text{-pg} = \frac{T\text{Se}}{T\text{Sh}} \times 100 \% \quad (2)$$

Description: V-ah = Expert validation
 V-pg = User validation
 TSe = Total score achieved
 TSh = Total expected score

After the score calculation and formative evaluation results are known, the percentage results will be matched using the product validity criteria table and the attractiveness criteria table.

3. RESULTS AND DISCUSSION

In this research and development, the resulting digital plane shape houses media for grade IV elementary schools. After the media has been developed, a formative evaluation and trials are carried out. This is done to know the deficiencies and errors found in digital plane shape houses media.

3.1. Formative Evaluation Of Learning Media Experts

The formative evaluation was carried out by a media validator on Monday, April 13, 2020. From the results of the formative evaluation, the developed digital plane shape houses media obtained a percentage of 86.87%. In formative evaluation, there are 4 components with several aspects that contain several points of assessment. The table of results of the formative evaluation of media experts as a whole contains 4 components consisting of 40 assessment items. The results of formative evaluation by instructional media experts can be seen in the following table 1.

The data obtained, then matched with the product validity criteria table shows that the digital plane shape houses media is a very valid media criterion. According to media experts, it needs minor revisions or improvements, namely adjusting the background volume with a balanced narrator volume and using images if they are not self-owned images, it is better to take and use images that are certain to be free of copyright. Learning media experts also said that digital plane shape houses media are good and can be used for research.

Digital plane shape houses media involves student activities in its use. According to instructional media experts, involving students in learning to achieve learning goals at the cognitive and psychomotor levels will make learning more enjoyable and meaningful. This is like the opinion of Daryanto & Karim (2017: 212) that one of the main characteristics of fun learning is the involvement of all senses and activities of the left and right brain and there is a challenging learning situation for students to think further and explore the material that will be studied later.

The media developed must be able to help students understand abstract material to be more concrete. This is relevant to the opinion of Asyhar (2012: 29) that learning media can help teachers in facilitating the learning process, clarifying material with various concrete examples, facilitating students and teachers to interact,

Table 1. Data on Formative Evaluation Results for Learning Media Experts

No	Aspect	Item Number	Score		Note
			TSe	TSh	
A. Components of the User's Manual					
1	Content (Content or Material)	1,2	7	8	Very Valid
2	Media constructs	2,4,5,6,7,8	18	24	Very Valid
3	Function	9,10,11,12,13	18	20	Very Valid
B. Learning Video Components					
1	Video Display	14,15,16,17	12	16	Very Valid
2	Function	18,19,20,21	15	16	Very Valid
C. Snakes and Ladders Game Components					
1	Constructs and Views	22,23,24,25,26,27,28	27	28	Very Valid
2	Function	29,30,31,32,33	18	20	Very Valid
D. Components of the User's Manual					
1	Design	Design	15	16	Very Valid
2	Content (Content)	Content (Content)	9	12	Very Valid
Total			139	160	
Average			3,47	4	

and even providing practical opportunities for students with learning media

3.2. Formative Evaluation of Learning Material Experts

A formative evaluation was conducted by a material validator on Monday, April 13, 2020. From the results of the formative evaluation, material on the developed digital plane shape houses media learning medium gained a percentage of 94.64%. At the formative evaluation, there are 4 components with some aspects in which it contains some grading grains. In the table, the formative evaluation results of the media expert as a whole contain 4 components consisting of 28 grading grains. Formative evaluation results by learning media experts can be seen in the following table 2.

From the data obtained then matched to the product validity criteria table shows that material on digital plane shape houses media including learning media criteria is perfectly valid. Based on the results of formative evaluation by the shopper material expert there's a

revision. Some need to be fixed or revised namely: 1) because the media is only in the form of information giving; 2) the design is dominant for school girls; 3) should the student be notified where the formulas came from, not just notified the formulas; 4) the examples in everyday life first new concepts; 5) are clear but do not help students find concepts; 6) punctuation please be noticed, plane shape that surface of an object, use the word "surface" on the matter; 7) consider the answer unit no.2; 8) square, rectangular, and triangle (less coma), the purpose of learning the page difference alone to be neat, punctuation please be noticed; and 8) need to be notified the order that should be opened first and the ladder snake may be opened once everything is completed is studied.

According to learning material experts, media digital plane shape houses media that can convey or provide information related to plane shape material clearly and markedly. This concurs with Sukiman (2012:44) that one of the practical uses of the media is to clarify the message or material as well as the information delivered thereby expediting learning and improving learning outcomes. This digital plane shape houses a media medium that can

Table 2. Data on Formative Evaluation Results for Learning Material Experts

No	Aspect	Item Number	Score		Note
			TSe	TSh	
A. Components of the User's Manual					
1	Material	1,2,3	12	12	Very Valid
2	Learning	4,5,6,7,8	18	20	Very Valid
B. Learning Video Components					
1	Material	9,10,11,12,13,14,15,16	31	32	Very Valid
2	Learning	17,18	7	8	Very Valid
C. Snakes and Ladders Game Components					
1	Learning	19,20,21,22,23	18	20	Very Valid
D. Components of the User's Manual					
1	Content (Content or Material)	24,25,26,27,28	20	20	Very Valid
Total			106	112	
Average			3,78	4	

Table 3. Test Result Data by Teacher Users

No	Aspect	Item Number	Score		Note
			TSe	TSh	
A. Components of the User's Manual					
1	Media constructs	1,2,3,4	16	16	Very Valid
2	Material	5,6,7	11	12	Very Valid
3	Function	8,9,10,11	16	16	Very Valid
B. Learning Video Components					
1	Video Display	12,13,14,15	15	16	Very Valid
2	Material	16,17,18,19	15	16	Very Valid
3	Function	20,21,22	12	12	Very Valid
C. Snakes and Ladders Game Components					
1	Constructs and Views	23,24,25,26	15	16	Very Valid
2	Material	27,28	8	8	Very Valid
3	Function	29,30,31	12	12	Very Valid
D. Components of the User's Manual					
1	Design	32,33,34,35	15	16	Very Valid
2	Content	36,37,38	12	12	Very Valid
Total			147	152	
Average			3,86	4	

overcome the limitations of place and provide a meaningful learning experience because plane shape learning turns out to be found in everyday life. This is in line with Suryani's opinion, et al (2018:14-15) positing there is a benefit of learning media for the teacher of one of them among others: 1) aiding the presentation of learning materials whose nature is abstract such as mathematics, physics, and others; 2) learning is not boring because of the varied media, and 3) creates an atmosphere of preoccupied and fun learning.

3.3. Test Results to Teacher Users

Digital plane shape houses media trials were conducted by two IVth grade teachers on Wednesday, April 15, 2020. The test results that teachers have conducted show that the learning media of digital plane shape houses developed to obtain a percentage of 96.7%. At the teacher user trial, there were 4 components with some aspects in which contained some grading grains. In the table, the results of the overall user trial contain 4 components consisting of 38 grading grains. The results of the trials by the teacher user can be seen in the following table 3.

The data obtained then matched to the product validity criteria table indicates that digital plane shape houses media including learning media criteria is perfectly valid. Based on the results of digital plane shape houses media trials by teachers' users there is no record on the column of criticism and advice so there is no major improvement or revision to digital plane shape houses media. Teacher users write down notes on the criticism column and suggestions that the products, displays, and presentations of teaching-learning activities are excellent.

Digital plane shape houses media can engage students actively in media use so that the presence of digital plane shape houses media can provide a meaningful learning experience. It is relevant to the opinion of Asyhar (2012:29) that the presence of a medium of learning, teachers do not need to provide much explanation in the form of words or verbalizes. Also, math teachers have absolute demands that in math learning should activate students, fun as well as meaningful (Revelation & Mahfudy, 2016).

3.4. Test Results to Student Users

The trials were conducted on IVth graders at SDN Bumiayu 3 Malang on Wednesday, April 15, 2020, to 6 students. This trial was conducted aiming to know the developed learning media could attract students' attention in the learning process as well as knowing the errors that were in the digital plane shape houses media. Based on the student's sticky results it can be known that digital plane shape houses media earned a 95.27% percentage of the win. At the media withdrawal trial to students there were 3 aspects with each aspect consisting of 5 grains. Aspects on such media withdrawal are aspects of view, media use and user reaction. The results of trials by student users can be seen in the following table 4.

The data obtained then matched to the table of product-dance criteria showed that digital plane shape houses media including learning media criteria was very interesting. On the sticky that has been given to 6 students, It can be known that students are interested and happy in the following learning using digital plane shape houses media. This is evident with notes delivered by students on columns of criticism and advice.

Table 4. Test Result Data by Student Users

No	Name	Score															Tse	Tsh
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
1	IIR	3	4	3	3	4	4	4	3	3	4	4	4	3	4	4	54	60
2	ANH	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	60	60
3	IPK	4	4	3	4	4	4	4	3	4	3	4	4	4	4	4	57	60
4	KSV	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	60	60
5	DPN	4	4	4	4	4	4	4	3	4	4	4	4	4	4	4	59	60
6	RRG	3	4	3	3	4	3	4	3	3	4	4	4	4	4	3	53	60
Total Score		22	24	21	22	24	23	24	20	22	23	24	24	23	24	23	343	360
Average																	57,2	60

Table 5. Critics and Trial Suggestion by Student Users

No	Name	Critics and Trial Suggestion
1	IIR	I like a very large house. Her house is a living room, bedroom, etc. The man who made the house creative. The media was very colorful.
2	ANH	I like the digital plane shape houses media because it's so interesting and a very funny miniature makes me excited. The miniature size is good, I can measure it easily.
3	IPK	Nice and interesting. I'm so easy to understand the plane shape square through the video about it that there's a sound and a picture.
4	KSV	The digital plane shape houses media is very nice and interesting. Moreover, many of his miniatures make up many plane shapes. So I like learning a lot of plane shapes.
5	DPN	The media is easy to understand, I easily understand the difference in circumference and the breadth of plane shape.
6	RRG	I like his house because it's good and creative, it's not boring. Moreover, there's a code like that so I can watch the video.

Based on the results of trials by students to see the withdrawal from digital plane shape houses media by students there is no record on the column of criticism and advice so there is no major improvement or revision to digital plane shape houses media. The entire student wrote down notes on the column of criticism and suggestions that digital plane shape houses media products are very interesting, creative and excited if using the media on learning

The stickies given to students showed that plane shape houses media could attract students' attention to learning plane shape material on the charge of math lessons. It is in line with the opinion of Suryani, et al (2018:14-15) bringing up there is a benefit of learning media for students one of which evokes curiosity from students and provides a pleasant atmosphere and boring typhoon. One component of the plane shape houses media is the presence of a learning video. According to one of the students, there was a video learning can help in understanding plane shape matter more clearly. This is reinforced with the opinion of Suryani, et al (2018:53). that the advantages of the audiovisual medium are inevitably easier for students to understand the material because it is delivered with images and sounds and more effectively with an auditive or visual student learning style.

4. CONCLUSION

Digital plane shape houses media that has gone through formative evaluations of media experts, material experts, and trials to users (teachers and students) are then made revisions following criticism and advice. The development of this media was developed with the Dick & Carey model. The lesson charge on this medium is mathematics with plane shape waking material. Formative evaluation results and trials showed that Digital plane shape houses media was valid and interesting so that it could be used in grade IV elementary school. Based on the results of formative evaluation by learning media experts, digital plane shape houses media earned a percentage of 86.7% and included highly valid media criteria. Based on the results of formative evaluation by learning material experts, the material on digital plane shape houses media earned a percentage of 94.64% and included highly valid media criteria. Based on product trial results to teachers' users, digital plane shape houses media earned a percentage of 96.7% and included highly valid media criteria. Based on product trial results to student users, digital plane shape houses media earned a percentage of 95.27% and included highly attractive media criteria digital plane shape houses media can be made a supporter in the mathematical

learning of plane shape materials for grade IV elementary school. Future researchers are expected to develop media with a broader scope. Other researchers can also examine the assessment section instead of the steps of learning.

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