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Development of Geometry Flipbook Multimedia Learning Media for Elementary School Students

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Abstract. This study aims to develop a learning media in the form of multimedia geometry flipbook that are suitable for use by elementary school students. This research uses Research and Development Method, with The phases in this research consist of; (1) product analysis, (2) design products, (3) Development, validation and revision. The data were collected using interviews, test, and questionnaires. The results of the research at the analysis stage, the researcher found problems through a geometry ability test, analyzed the curriculum, and the students needs. The results of the design stage, namely designing the story board, preparing the content/material to be included in each menu, and compiling the learning media assessment instrument. The results of the development stage, namely product manufacture and validation and revision. The results of expert validation by material experts are included in the very worthy criteria (96.95%). The results of the validation by media experts showed very worthy criteria (98.18%). The results of the six teacher's responses as learning practitioners showed very worthy criteria (89.04%). Based on these results, the multimedia flipbook learning media for elementary school students is suitable based learning media for geometry material in elementary schools.

Keywords: development, multimedia, flipbook, geometry

INTRODUCTION

As information and communication technology develops students are accustomed to carrying out all learning activities using computers, laptops or devices so that teachers have new challenges in updating the learning process based on advances in information and communication technology, while teachers are required to be able to operate information and

communication technology properly and can think creatively, innovatively and independently.

In the learning process the presence of the media is very important, the learning media serves to facilitate the teaching and learning process. Learning media is a very important role in helping and supporting the learning process to run effectively, learning media serves to facilitate the teaching and learning process.

Learning media plays an important role in helping and supporting the learning process to run effectively. According to Duludu (2017,p.9) "Learning media is an intermediary used by teachers to transmit messages or information to students so that they can be aroused when participating in learning activities". One of the uses of media that has an important role is in learning mathematics, where mathematics is one of the subjects that has a teaching system that requires teachers to be actively involved in student understanding.

Based on the results of interviews conducted by researchers at elementary schools in Mattiro Bulu District, Pinrang Regency, namely UPT SDN 166 Pinrang, UPT SDN 73 Pinrang, UPT SDN 191 Pinrang, UPT SDN 76 Pinrang, UPT SDN 237 Pinrang and UPT SDN 179 Pinrang. Researchers conducted interviews with six-grades teacher related to the use of mathematics learning media. From this interview, it was obtained information that the teacher used learning media in the form of modules, image media, and PowerPoint. From this interview, it was also obtained data that with the use of these learning media students still experienced learning difficulties, namely lack of understanding of mathematical concepts, lack of problem-solving skills, and lack of student interest in lessons.

In fact, Mathematics is still seen as a subject that is difficult for students to understand, data released by the PISA (Program For International Student Assessment) in 2018 has been announced by the (OECD) 2018 (The Organization for Economic Co-operation and Development), PISA measurement involves 12,098 students from 399 schools in several regions in Indonesia that represent tests related to mathematical abilities, the results show that mathematical abilities are low, Indonesia obtained an average score of 379 mathematics skills with an OECD average score of 487. Indonesia is in 75th place out of 79 countries.

Rusyda et al., (2017) in the International Conference on Mathematics and Science Education (ICMScE) revealed that students mathematical problem solving ability is still low. The students have difficulties to solve a problem that measures problem solving ability. Based on the research, the students problem solving ability has low score on aspect of make model that is 23,53% and interpret result obtained that is 32,35% which including very bad qualification. Other research said students

problem solving ability is low because students are not familiar to solve problem solving problems (Windari et al., 2014).

Nurhasanah et al (2017) in the International Journal on Emerging Mathematics Education revealed that geometry is a branch of mathematics and is one of the subject matters in mathematics in elementary schools. Geometry is closely related to the formation of abstract concepts. This learning can not only be done by transferring knowledge or lecturing, but must be done by forming concepts through a series of activities carried out directly by students. Furthermore, according to Nur'aini et al (2017) geometry is one of the fields in mathematics that studies points, lines, fields and spaces as well as properties, measures, and their relationship to other. When compared to other fields in mathematics, geometry is one of the fields in mathematics that is considered the most difficult to understand.

One of the materials that may provide the students with the logical thinking, besides the logic is Geometry. The aspect the students should study and learn dealing with the logical thinking may be seen in a series of activities in solving the Euclidean Geometry In'am (2016) As stated by Adolphus (2011) the mathematical material that is considered difficult and feared by students in mathematics is geometry. This resulted in students being reluctant to learn geometry and in the end the goal of learning geometry to develop problem solving abilities could not be achieved.

Data related to students' difficulties in understanding geometry material is found in research conducted by Fauzi & Arisetyawan (2020) in their journal entitled "Analysis of Student Learning Difficulties in Geometry Material in Elementary Schools" describes that the geometry material was given to 26 students of SD Negeri Asmi 033 Bandung. The results of the analysis show that there are difficulties faced by students in answering geometry questions, these difficulties include students having difficulty in using concepts, students having difficulty in using principles, and students having difficulties in solving verbal problems.

Furthermore, Zainal (2017) also conducted research related to understanding geometrical material in a journal entitled "Analysis of Geometry Thinking Processes Based on the Van Hiele Theory of Students at SD Negeri 3 Parepare". The results showed that the majority of students were still in the lower

rank or L0 and L1 is 100 people from a total of 104 students or 96.1%. The qualitative analysis shows that the students' low PBG is mostly due to the quality of teachers who do geometry learning, not applying a contextual approach and less emphasis on basic geometry materials.

Facts in the field show that students geometric achievements are still low. The results of a 2011 TIMSS review that assessed math and science skills showed achievement scores in geometry content for grade 4 and grade 8 in various countries including Indonesia were still low at only 49% and 39% compared to other math content. The average score of Indonesian students in grade 8 is only 386 and for geometry content only 377 from the international scale is 500. The absorption of geometry mastery at the UN in 2013 in SMPN 2 Rembang based on the BSNP report also showed that it was still very low at only 60.98 and at the city / district level Rembang only 45.68, province 56.69, and national level 52.82 (Kurniawati et al., 2015).

The students achievement of geometry is low, due to several factors including a lack of understanding in the study of geometry that many students fail to develop an adequate understanding of geometric concepts, geometric reasoning, and geometric problem-solving skills. Selection of learning strategies that are less precise and pay less attention to the thinking skills of students 'geometry (Safrina et al., 2014).

According to the National Council of Teachers of Mathematics (NCTM) Muhassanah (2014) understanding the concept of geometry must be possessed in learning mathematics among them so that learners: 1) can analyze the nature and shape of geometry both 2D and 3D; 2) being able to construct mathematical arguments about the relationship of geometry with others; 3) the application of transformation and using it symmetrically to analyze mathematical situations; and 4) use visualization, reasoning, spatial, and geometric models to solve problems.

Given the importance of geometry in education, it is important for teachers to find better ways in the teaching process. students need to master basic geometry skills which consist of visual, verbal, drawing, logic, and application aspects. It can be seen that if all this time the teacher has used books/ modules as a source and teaching media, it is necessary to be new in the use of media so that it has an impact

on the development of students' geometrical abilities.

Geometry learning has also not integrated the use of technology. Geometry can create situations in the classroom that help students develop their thinking skills in learning geometry and improve their understanding of geometry. Through the use of sketchpad geometry (mathematical software) helps students in understanding abstract geometric concepts and visualizing them in the form of images.

Adjusting the development of science and information and communication technology, many teachers develop and make updates in learning activities using multimedia. The multimedia program was born because of the development of computers and digital Pribadi (2017) it supports teachers and educators in efforts to develop and update learning activities. Multimedia is a combination and integration of text, images, audio and motion pictures that are presented in a balanced manner and pay attention to the elements of art contained in a program using a computer (Kustandi & Darmawan 2020).

One form of multimedia is the flipbook. Flipbooks are a series of interesting pictures, text and colors that are connected to one another. Flipbooks are often used as learning media. Developing a multimedia flipbook is expected to create a renewed learning atmosphere. According to Ramdania Sugiyanto et al., (2013) the use of flipbooks can increase students 'learning motivation and can also affect students' learning achievement. This is because the flipbook has a series of interesting pictures, writing and colors that are connected to one another so that students are interested and enthusiastic in paying attention to the material that is mediated by the flipbook as a learning medium.

Based on the description above, multimedia flipbook geometry was developed to improve students geometry skills. The use of learning media is one of supporting the achievement of learning objectives for example in learning geometry. Abstract geometry can be easily studied which is presented in a concrete form in the form of a model, image or animation. This concrete form must be sought by the teacher so that the objectives of geometry learning can be achieved (Siagian et al., 2019).

The novelty presented in developing this learning media is in the form of more

interesting and interactive animations where flipbooks are generally in the form of a textbook display with fairly dense material, but in this media there will be a presentation of more complex and in-depth material accompanied by animation as an interactive presentation for students. Multimedia flipbooks were chosen to adjust the needs and characteristics of students so that they are more enthusiastic about participating in learning activities using digital media, which will have an impact on increasing motivation, interest and understanding, also help to concrete students' understanding, and can create a new and fun learning atmosphere, of course to achieve learning goals.

METHOD

The type of research used is research and development or Research and Development (R&D). According to Sugiyono (2011) R&D research method is a research method used to develop or validate products used in education and learning, it is also a research method used to

produce certain products and test the effectiveness of these products.

Richey and Clients in Silalahi (2017, p. 3) stated "...is the systematic study, development and evaluation processes with the aim of establishing an empirical basis for the 3 creation of instructional products...".

In this study, researchers used the ADDIE development model design by Dick and Carry because it is more general and in accordance with the objectives of the media development to be carried out. The ADDIE model according to (Kusprimanto) 2014, p. 5 which is an acronym (Analysis), Design (Design), Development (Development), Production, Implementation or Delivery (Production, Implementation or Exposure) and Evaluation (Evaluation), but in this study prospective researchers only use 3 (three) stages. The ADDIE development model can be modified or used because of its dynamic and flexible advantages according to the needs of researchers in their research, as for the stages in this research, namely:

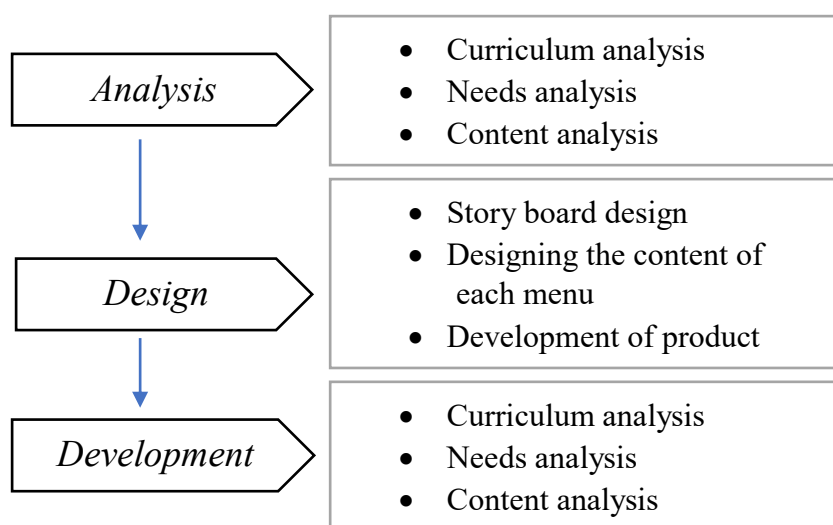


Figure 1. The stages of research on the development of a geometry flipbook multimedia

Based on figure 1, at the initial stage of development, analysis activities are carried out, namely curriculum analysis, needs analysis and content analysis. This analysis aims to obtain initial data as a basis for developing material on learning media. In the need's analysis stage, it is carried out in two stages, namely cognitive analysis by conducting a geometric ability test and a needs analysis for developing media design by filling out a questionnaire.

Furthermore, the design stage involves designing a storyboard, designing the content of each menu, and compiling a product appraisal instrument. The final stage in this research is development, by referring to the results of the analysis at the initial stage, the media product will be developed, then validate by material / content experts, media experts and learning practitioners, as well as revisions from experts obtained from the evaluation questionnaire. The

value obtained is then accumulated to determine the feasibility of learning media results based on the following table.

Table 1. Media Eligibility Criteria

Score in percent (%)	Eligibility Category
81% - 100%	Very Worthy
61% - 80%	Worthy
41% - 60%	Decent enough
21% - 40%	Unworthy
0% - 20%	Very Unworthy

Source: Adapted from Arikunto (in Ernawati, 2017)

RESULTS AND DISCUSSION

Results

The results of the analysis in the early stages were obtained through a needs analysis by conducting tests and filling out a questionnaire on 106 grade VI students, while the test used 27 multiple choice questions taken from each KD geometry material. The results of the geometric ability test show the basic competencies that have not been achieved by students. After conducting a study and mapping of KD based on the test results, it was found that the material to be developed in this media was geometry for elementary school students who generally discussed points, lines, shapes and spaces, and angles, but would display material with a more detailed discussion. depth on indicators that are still lacking based on the geometric ability test, namely the type of angle, polygon, area and perimeter of the shape, determining the type of line, determine the

volume of the shape, the network of the cubes, the radius and the results of the design stage are then interpreted to the Development stage and validated by experts, including material experts, media experts, and learning practitioners, in order to obtain appropriate media. has met the criteria. Through this diameter of the circle, the circumference and area of the circle, the nature of the shape, and the volume of the shape. The purpose of presenting these indicators in depth is to further improve student understanding.

The results of the overall needs analysis questionnaire given to students showed that students were happy if digital media was developed that had more complete animation and material components, and to support development and needs, learning media was developed in the form of multimedia geometric flipbooks which had attractive values in terms of appearance. visual, in the form of animation and presentation of material tailored to the needs of understanding and achieving the competence of students.

Based on the results of the needs analysis and after identifying the material to be developed, then making a flipbook design, several design steps are taken starting from designing the cover, storyboard, to the content of each menu. Can be seen in Figure 2. assessment, the researcher is directed to revise according to the suggestions so that the results of the media development are more optimal. The geometry flipbook multimedia learning media has met several criteria in accordance with the objectives of developing a geometry flipbook multimedia learning media, so that it can help improve students' learning motivation and geometry abilities.

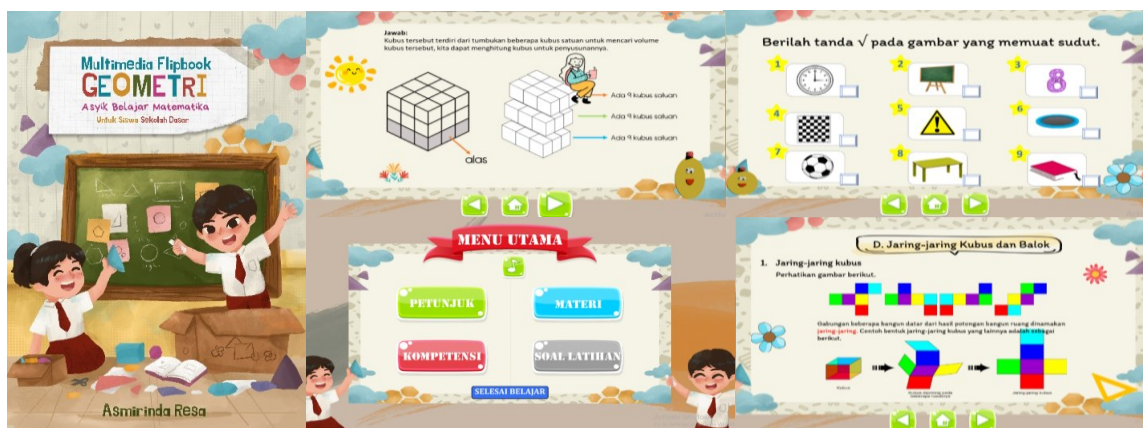


Figure 2. Design of geometry *flipbook* multimedia

Evaluation of the feasibility of multimedia flipbooks through validation was carried out by two experts, namely material experts and media experts, the results of the assessment given includes two aspects, namely the substance of the material and instructional media design, each aspect consists of four

indicators, the accumulated feasibility assessment refers to the score interval in table 1 and has been adjusted to the number of indicators in each aspect, the results of the multimedia flipbook assessment can be seen in table 2.

Table 2. The results of the feasibility assessment by the media

No	Aspect	Score	Assesment Quality
1	Material eligibility	98%	Very Worthy
2	Language	98%	Very Worthy
3	Presentation	93%	Very Worthy
4	Learning suitability	96%	Very Worthy

Table 3. The results of the feasibility assessment by the material

No	Aspect	Score	Assesment Quality
1	Language	98%	Very Worthy
2	Presentation	99%	Very Worthy
3	Learning suitability	99%	Very Worthy
4	Thorough view	97%	Very Worthy

Tables 2 and 3 show that the learning media developed after being assessed by material experts obtained scores from the validation results of material experts on the learning aspect are in the range $X > 80\%$. Thus, the multimedia learning media for the geometry

flipbook is feasible in terms of the material aspect. In terms of the feasibility of the media design aspect by media experts, it was obtained a score of $X > 80\%$ so that it got the "Very Worthy" category.

Table 4. The results of the practicality

No	Aspect	Score	Assesment Quality
1	Conformity with learning strategies	86%	Very Worthy
2	Language	88%	Very Worthy
3	Presentation	95%	Very Worthy
4	Thorough view	97%	Very Worthy

That the learning media developed thus, the multimedia flipbook geometry learning media is considered feasible to be used as a learning medium in terms of the learning media aspect. Furthermore, an assessment is also carried out by the learning practitioner regarding the suitability of the media with the learning strategy, linguistic aspects, aspects of media presentation / appearance. The results of the practitioner's assessment of learning can be seen in table 4. After the results of the assessment of experts and learning practitioners, it is known

that the overall learning media are has been deve-

Discussion

The results of the assessment by the validators show very feasible qualifications in the multimedia flipbook geometry learning media, this is supported by the validation results from the material and media/content experts who direct the researcher to revise until the product developed meets the proper criteria. The results of the assessment are in accordance with the identification of the benefits of learning

media as argued by Kemp and Dayton in Solihatin (2012) that the delivery of material becomes uniform, learning becomes clear, interactive and interesting, streamlines time and energy and improves the quality of student learning outcomes. Based on the content of the learning material, the material is in accordance with KI & KD, the suitability of learning media with the characteristics of elementary school students who have curiosity, are happy with the visual aspects, are interactive and actively ask questions. The use of this learning media is adjusted to the learning conditions provided at school and can also be used outside of learning hours as a source of independent learning for students.

The results of the material expert validation at the final stage obtained a score of 96.95% with very worthy criteria. The results of the media expert validation were 98.18% with very worthy criteria. Based on the response of the teacher as a learning practitioner, the score was 89.04% with very worthy criteria. The product developed by the researcher obtained an increase in quality both in terms of content/material, application and features of the learning media.

Based on the whole process that has been carried out by the researcher starting from the initial analysis stage and the research, it is obtained a reflection that the development of multimedia learning media for the geometry flipbook shows and leads to hoped that meets the eligibility criteria and is then ready to be tested. changes in the learning process. The development of multimedia flipbooks has been researched and developed by (Hayati et al., 2015), (Rahmawati et al., 2017), (Andini et al., 2018), (Yulinar, 2019), (Yayi & Yuliana, 2019) with the results of their research, namely the results of the development are very feasible and can help learning activities, increase student interest, motivation and learning outcomes.

Changes that began with verbalism teaching techniques to be active, interactive and fun. This media also directs students to try to be more independent in learning and answering questions. This is in accordance with the opinion of an expert named Latuhem in Orowala (2017) regarding the benefits of learning media. As for the benefits of learning media, namely: (1) Attracting and enlarging students' attention to the teaching material presented; (2) Learning media reduce or even eliminate verbalism; (3) Overcoming differences in learning experiences

based on the socio-economic background of students; (4) Providing new learning experiences; (5) Overcoming space and time boundaries; (6) Helping the development of students' minds regularly; (7) Cultivate the ability to do business on their own based on experience and reality; (8) Allows direct contact between students and teachers, the community and the environment around them.

9 CONCLUSIONS AND SUGGESTIONS

Based on the results and discussion described above, it can be concluded that the development of multimedia learning media for geometry flipbooks is suitable for use in elementary schools based on assessments by material experts and media experts. Besides that, practical geometry flipbooks are used in learning geometry based on assessments by learning practitioners, it is suggested that in the future multimedia geometry flipbooks can be developed in various series and used as learning media in schools, of course after testing the effectiveness of these products.

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