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Development of contextual brochures in learning mathematics to improve student learning outcomes and creativity

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abstract

This study aims to produce brochure teaching materials for contextual-based mathematics learning. After the brochure is applied in learning, it will be analyzed whether it can improve mathematics learning outcomes and students' creativity. This study is development research, using 4D development design (define, design, develop, disseminate). The development test was conducted at SMP Assuniyah Losari, involving 52 students. 26 students of class VII A as the control class and 26 students of class VII C as the experimental class. The data collection instruments used in this study were interviews, questionnaires and tests. The results of this study are: (1) producing a mathematics learning brochure with a contextual approach through a 4D development design, (2) a contextual mathematics learning brochure obtaining a score of 0.94 based on the assessment of material experts with high validity criteria, and getting a score of 0.86 based on an expert assessment. media with high validity criteria, (3) the results of data processing on student learning outcomes and creativity using SPSS version 25.0, showed a difference between the control and experimental classes. the use of contextual-based mathematics learning brochures is proven to significantly improve student learning outcomes and creativity. Student responses also showed positive results with a cumulative percentage of 78%.

Keywords:
Mathematics Learning Brochure; Contextual Learning; Student Creativity;

INTRODUCTION

According to Wahyuni (2010) Learning is an activity related to the process of seeking knowledge. As it is known that the Qur'an and Hadith invite Muslims to seek and gain knowledge and wisdom, and also people who have knowledge will gain high dignity (Faizah, The essence of learning and learning, 2017). This means that learning has an important role in increasing one's knowledge. As stated in the Qur'an Q.S. Al-Alaq verses 1-5 regarding the command to seek knowledge which means as follows: "From a clot of blood. Read, and Your Lord is the Most Gracious. Who teaches people through the use of kalam. He teaches people what they do not know."

From the translation of Q.S. Al-Alaq verses 1-5 explain the importance of learning in life. By studying someone will know many things that were not known before. When learning, a person cannot immediately master knowledge, but it takes a process until that person can achieve learning goals. Through education a person is trained and guided to become a more knowledgeable person. According to Rooijakkers in (Nurdin, 2017) that the learning process is a learning activity carried out by teachers and students, as well as the interaction between them and learning resources. A learning activity will run well if it is supported by adequate learning components. Important learning components include teachers and students, both of which are inseparable and related to each other. Learning activities and optimal learning outcomes will be achieved if the two components are intertwined with supportive interactions.

The existence of an interaction between teachers and students is to determine the extent to which the ability of students to accept the material being studied. So that the teacher can find out whether the material that has been delivered can be accepted by students. teachers can also find out various kinds of problems, experiences and students' imaginations that can be implemented in learning activities. This good interaction will encourage the creation of a fun learning process. In addition to direct interaction, this interaction between teachers and students can also be assisted by using learning materials.

In the learning process, teaching materials are used by the teacher as a reference source that students can use to gain knowledge apart from the information conveyed by the teacher. Mathematics is an important part of science and technology, needed by everyone as a means of thinking, because itcan provide benefits and convenience in carrying out daily activities. Mathematics is one of the subjects that occupies an important role in education (Fauziah & Wahid, 2021). Therefore, the existence of teaching materials is important in mathematics learning activities, and teaching materials must also be adjusted to the learning objectives expected by the teacher. Teaching materials are used to support learning activities which can also increase students' knowledge. By using interesting and creative learning materials, students will not quickly feel bored and focus on learning. With good teaching materials, the learning materials taught can be accepted by students quickly and easily. As explained in the word of Allah SWT. On Q.S. Al-Maidah verse 46 which means as follows: "And We accompanied in their footsteps (the prophets of the Children of Israel) with Jesus son of Mary, justifying the previous Book, namely the Torah. And We have given him the Gospel, in it (there is) guidance and light (which illuminates), and confirms the previous book, namely the Torah. And be a guide and a teaching for those who are pious."

From the translation On Q.S. Al-Maidah verse 46 is known that the revelation of the Al-Quran is to perfect the previous books and contains guidelines and instructions for mankind. Following the same spirit, in developing teaching materials, both printed and non-printed, it is hoped that they can be a guide for students while studying. Good learning materials contain clear learning instructions, so students are able to follow these instructions to get the expected learning objectives. In addition, a good teaching material must use language that is easy to understand.

Teaching materials are divided into 2 types, namely teaching materials in print and non-printed. Printed teaching materials include: Student Worksheets, modules, brochures, handouts, wallcharts. While non-printed teaching materials are divided into 4, namely Audio (such as: cassette, radio, audio, CD, PH), visual (such as: pictures, photos, models / mockups), multimedia (such as: Computer based, Interactive CD, Internet) (Purnomo, 2011). Brochures can be an alternative to new teaching materials that are interesting and not boring for students. Brochures are concise learning materials, arranged systematically, consisting of several pages that are folded without being bound, and can be designed with various attractive designs. Brochures can also be equipped with pictures that attract readers' interest. With these pictures, students feel interested in reading the brochure and get the knowledge stored in it.

The decrease in students' interest in learning, can also reduce the level of student creativity. Kristin revealed (2016:11) that creativity is a person's ability to generate ideas or ideas he has so as to produce something new that has usefulness (Surya et al., 2018). Creative thinking is needed for someone because this is the basis for responding to the responses received in finding solutions to the problems they face. The reality in the field regarding the ability to think mathematics is still low when viewed from the results of PISA several years earlier. This is based on the PISA study several years earlier that did not show satisfactory results. The results of the last year's study, 2015 with a score of 386 in the field of mathematics competence, increased when compared to 2012 with a score of 375. However, when compared to the overall average of 490, the level of achievement was still below the average (OECD, 2012) (Agasisti & Zoido, 2018).

In addition, the results of the 2015 TIMSS study (Rahmawati, 2017) revealed that Indonesian students need to strengthen their ability to integrate information, draw conclusions, and generalize their knowledge to other things and this can be seen in the difficulty of students proving mathematics clearly. due to lack of understanding of mathematical concepts and rules (Bernard et al., 2018). Indonesian students still need to be developed for high-level abilities, one of the higher-order thinking skills is the ability to think creatively. Through learning mathematics as outlined in contextual-based brochure teaching materials, it is expected to be able to develop creative thinking skills and have a curious attitude towards mathematics.

Based on interviews with mathematics teachers at SMP Asuuniyah Losari, textbooks and worksheets are the main learning resources used in the learning process. As it is known that textbooks and worksheets are only filled with so much writing with so few pictures that many students feel bored and are not interested in reading the material. In addition, questions were also asked to the mathematics teacher about the methods used in learning. the teacher said that he had used various approaches in learning that could attract students' interest. One of the learning approaches that have been used by teachers in the

teaching process and will be reused by researchers is the contextual approach. Researchers will develop brochure teaching materials using a contextual approach as a basis. The use of this contextual approach is to create a fun learning process so that students can develop their potential naturally and be able to hone their creativity. The making of teaching materials for this brochure is to answer the conditions that occur, namely after interview sessions with students regarding mathematics learning are carried out at school, students feel bored, unhappy, sleepy, and also lazy because there are no interesting teaching materials and teaching materials. Students are only guided by LKS and textbooks that can only be borrowed at the library. Students feel bored with the teaching materials provided, students hope for new and different teaching materials. At the same time creative and innovative teaching materials that can improve the concept of understanding in mathematics.

Considering the 2013 curriculum in which students are required to be more active in finding out in advance the information that will be discussed in solving problems contained in mathematics material, while the teacher's role is only to straighten and strengthen the concept of a material being taught. The strategy used by researchers in this study is to create innovations to develop contextual-based brochure teaching materials using Microsoft office publisher and Canva applications. The use of contextual learning brochures as teaching materials is expected to be useful as a learning resource and able to improve student learning outcomes and creativity in mathematics subjects at Asuuniyah Junior High School Losari.

METHODS

The type of research used in this research is R & D (Research and Development). R&D is research that is used to produce a certain product, in addition to producing a new product, this research can also be used to develop a product or improve existing products (Rizki, 2019). The model used in this study is the 4D model, the stages in this 4D research are: (1) Define, the define stage is the stage to define and define the learning requirements. This define stage includes five main steps, namely front-end analysis, student analysis (learner analysis), task analysis (task analysis), concept analysis and formulation of learning objectives (specifying instructional objectives) (Solikin & R., 2019). (2) Design (Planning), the design stage aims to design learning devices. Four steps must be taken at this stage, namely: (a) preparation of test standards (criterion-test construction), (b) selection of media (media selection) in accordance with the characteristics of the material and learning objectives, (c) selection of format (format selection).), namely reviewing the formats of existing teaching materials and determining the format of teaching materials to be developed, (d) making an initial design according to the selected format. (3) Develop (Development), the development stage is the stage for producing development products which is carried out through two steps, namely: (a) expert appraisal followed by revision, (b) developmental testing. The purpose of this development stage is to produce the final form of learning tools after going through revisions based on input from experts/practitioners and test data. (4) Disseminate, the dissemination process is a final stage of development. The dissemination stage is carried out to promote the development product so that it can be accepted by users, either individuals, groups, or systems.

Population and Sample

The population in this study were all seventh grade students of SMP Assuniyah Losari, totaling 101 students. While the research sample was determined using the Slovin formula with a value of e = 0.1 and obtained a sample size of 52 students.

Data Collection and Analysis

Data collection techniques in this study are interviews, questionnaires, and tests. This interview is a preliminary study, namely to find out and obtain problems that need to be researched. Meanwhile, this questionnaire will be given to media experts, material experts, and students who have participated in learning activities using mathematics brochure teaching materials. And this test technique is carried out by giving pro-test and post-test questions to determine student learning outcomes and creativity in mathematics subjects using contextual mathematics learning brochures.

Data analysis techniques used in this study are qualitative analysis and quantitative analysis. This qualitative analysis is used in describing the results of the interviews. The data obtained were analyzed descriptively qualitatively. While qualitative analysis will be used to describe the quality of the media based on data from media expert questionnaires, material experts and describe test results along with student response questionnaires after using teaching materials in the form of mathematics learning brochures.

RESULT AND DISCUSSION

Mathematics learning brochure teaching materials are the result of this research. In this study using a 4D model from S. Thrigharajan, Dorothy S, Semmel, and Melvyn I. Semmel (1974), this 4D development model consists of 4 stages of development, namely define, design, develop, disseminate (spread) (Rizki, 2018). The following will explain the result data for each stage:

Defining Stage

The definition stage is also known as needs analysis, some of the main steps carried out at this stage are:

(1) Front-end analysis (initial analysis) – Based on the results of interviews with mathematics teachers, information was obtained that student learning activities only used LKS (Student Worksheets) which only contained material and examples of questions that were less interesting. In the line and angle material, the teacher has not used contextual mathematics brochure teaching materials as a tool.

(2) concept analysis – Sub-materials that are appropriate and included in the teaching materials are based on the previous analysis, namely the Front-End analysis, namely Prerequisites, Instructions for Use, Core Competencies (KI), Basic Competencies (KD) from the mathematics brochure teaching materials. This is supported by the results of interviews with Ibu Iim Imroatin, S, Pd. As a math teacher. He said that there was no educator who had developed teaching materials for mathematics brochures on lines and angles as teaching materials to support learning.

(3) task analysis – the results of the task analysis for class VII material on lines and angles are as follows:

Table 1
Task analysis

Analysis Section	Analysis Results
Basic competencies	Analyze the relationship between angles as a result of two parallel lines cut by a transverse line.
Indicator	1. Determine the relationship between points, lines, and planes. 2. Observing the position of two lines (parallel, coincide, intersect) 3. Determine the concept of angle 4. Determine the types of angles 5. Solve the relationship between angles
Theory	Lines and angles

(4) formulation of learning objectives such as: (a) Students can know the relationship between points, lines, and planes. (b) Students can know the position of two lines (parallel, coincide, intersect). (c) Students can know the concept of angle. (d) Students can determine the types of angles. (5) Students can know and solve the problem of the relationship between angles.

Design Stage

At this design stage, it began with the preparation of a material expert and media expert validation questionnaire to determine the feasibility of the developed media, and also a questionnaire was given to students to see student responses to the media. Furthermore, the selection of media is carried out, the media chosen to be developed is a contextual-based mathematics learning brochure. Continuing to choose the format, this teaching material uses A4 paper size, 1.0 spaced scale; Calibri, Lucida Calligraphy, Maiandra GD, Cambria math, and Times New Roman fonts. The initial design for making this learning brochure is: Title, Basic Competence.

Development Stage

The learning brochure that has been designed is then validated against 2 material expert validators and 2 media expert validators. Determination of expert subjects has criteria, namely experienced in their field and educated at least S2. In addition, validation was also carried out on the mathematics teacher of SMP Assuniyah as a practitioner subject, with criteria of experience in their field and a minimum of S1. The scale used in this validation is the Likert scale. The results of material validation by experts and teachers are as follows.

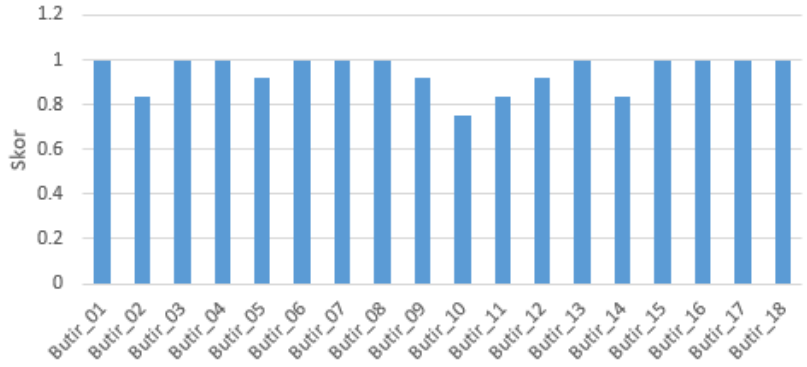

Figure 1
Material Expert Assessment

The results of media validation by media experts and teachers are as follows.

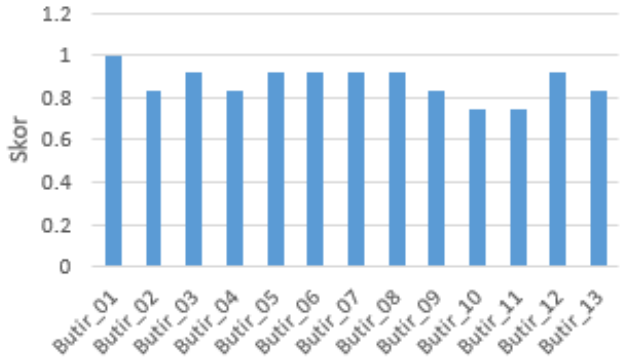

Figure 2
Media Expert Assessment

After being validated by material and media experts, design improvements were made, all data from reviews, assessments, and discussions with material and media experts as well as mathematics subject teachers were taken into consideration in the context of improving and perfecting this contextual-based mathematics brochure teaching material. After the brochure teaching materials were declared worthy of being produced by material experts and media experts, the next step was to conduct a trial by using brochures as teaching materials in learning activities. The results of this trial will be used as a reference in revising teaching materials.

Before the trial of using the brochure teaching materials was held, pre-test questions were given first, after the pre-test was completed, a lesson was held using the mathematics brochure teaching materials from indicators 1-5 for 5 meetings. Then a post-test was carried out after the completion of the learning process using brochure teaching materials.

Disseminate Stage

At this stage of dissemination, the researcher conducted a limited distribution due to the limitations of the researcher. This study brochure was only distributed to one of the mathematics teachers at SMP Assuniyah Losari as a place of research.

Data Analyze

To determine the significance of the increase in student creativity test results and student learning outcomes, the researchers conducted an analysis of the paired sample t test,

before the t test was carried out, normality and homogeneity tests were carried out first. Before the normality test, the n-gain test is carried out first, after the N-gain value is obtained then a normality test is carried out, the results of the normality test of the N-Gain value of the experimental and control classes using SPSS Version 25.0 software, in the experimental class a significance value of 0.208 is obtained, and the significance value of the control class is 0.560. This means that the N-Gain value for the Experiment and Control class is > 0.05. Because the significance value is > 0.05, the data is said to be normally distributed. Then with the same software, the researchers conducted a homogeneity test. The results of the homogeneity test using SPSS Version 25 software, it is known that the significance value based on the average value is 0.787, while the significance value based on the median is 0.977, this means the significance value of the experimental class post-test data and control class post-test data > 0.05, so it can be said that the variance of the experimental post-test data and the control post-test data is the same or homogeneous.

Furthermore, because the data is normally distributed, the paired sample t test was carried out. With the same software, the researcher conducted a paired sample t test. The results of the paired sample t test using SPSS Version 25.0 software are known as Asymp.Sig. (2-Tailed) is worth 0.000. Because the value of 0.000 is smaller than <0.05, it means that there is a difference between the results of student creativity and student learning outcomes before and after using the strong and significant contextual mathematics brochure teaching materials. Then with the same software, the researcher conducted an independent sample t test. The results of the independent sample t test using SPSS Version 25.0 software, it is known that the Asymp value. Sig. (2-Tailed) of 0.000 < 0.05. This means that there are significant differences in the results of student creativity and learning outcomes in Mathematics between the experimental class and the control class.

Based on the data obtained above, it can be concluded that the use of brochure teaching materials in the learning process can significantly improve students' creative abilities and student learning outcomes on line and angle material. The increase in students' creative abilities in the mathematics material above is in line with students' responses to the use of contextual mathematics brochure teaching materials during learning activities. The results of student responses are stated in the form of assessments on student response questionnaires. It can be seen that all indicators in teaching materials get a score percentage above 61% or in other words almost all students give a positive response regarding the use of mathematics brochure teaching materials in the learning process. Which shows that student learning outcomes have increased significantly between groups of students who use brochure teaching materials and groups of students who do not use brochures so that it can be interpreted that contextual mathematics brochure teaching materials are effective on student learning outcomes. So that researchers can conclude that student learning outcomes are strongly influenced by the response to the use of mathematics brochure teaching materials. If the student's response to the use of brochure teaching materials is good, then the learning outcomes outlined in the test questions will show good results, and vice versa if the student's response to the brochure teaching materials is not good, the learning outcomes outlined in the test will also show good results. not good either.

The increase in students' creative abilities above is in line with student responses to the use of brochure teaching materials during learning activities. In table IV.17 it can be seen that almost all students gave a positive response regarding the use of brochure teaching materials during learning with a cumulative percentage of 78%. So it can be interpreted that the use of teaching materials in learning activities is needed to maximize learning to improve student understanding so that it can run quickly, effectively and efficiently so that learning objectives can be achieved.

CONCLUSION AND IMPLICATION

Brochure teaching materials were developed using a 4D model. The material expert validator obtained an average value of 0.94 with high validity criteria and deserves to be tested, while the results from the media expert validator obtained an average value of 0.86 with high validity criteria and deserves to be tested, so based on the assessment of the expert validator, the contextual-based mathematics brochure teaching material on line and angle material is appropriate to be used as a learning medium. the use of contextual-based mathematics learning brochures on line and angle material has been proven empirically and significantly improves students' creative abilities and student learning outcomes. This is also reinforced by the results of the student response questionnaire that almost all students gave a positive response regarding the use of brochure teaching materials during learning with a cumulative percentage of 78%.

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