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BOOKLET DEVELOPED TO MAXIMIZE MATHEMATICS LEARNING

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ABSTRACT

Booklet media as a development product to learn mathematics independently in order to improve student learning outcomes. The research method used is Research and Development (R&D) using the ADDIE model with the One Group Pretest Postest Design approach. The results showed that: 1) three media expert validators, three linguist validators and three material expert validators by 85% with very valid categories. 2) 10 samples in the reliability test on chronbach's alpha table, namely 0.716>0.60 with specifications suitable for use and student response to the distribution of questionnaires 92.7% with practical and effective specifications in terms of appearance. 3) the application of booklet media was analyzed using pretest questions through a homogeneity test of 0.457>0.05 which means homogeneous and a reliability test of kolmogorov smirnov of 0.962>0.05 with normal distribution and can be applied in class 5. 4) measuring the effectiveness of booklet media development through paired sample t-test with spss, namely 0.00<0.05 so that there is an influence on the effectiveness of critical thinking.

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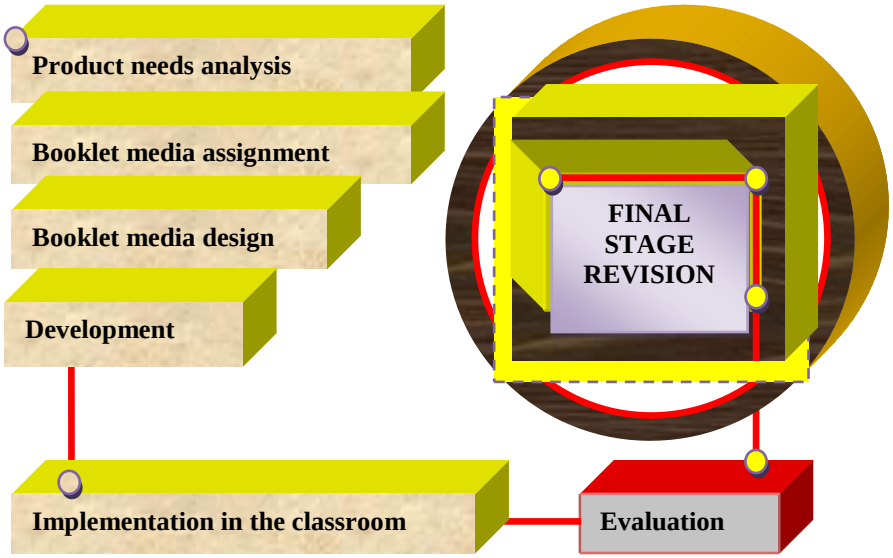
1. INTRODUCTION

The long process in the systematics of education in Indonesia makes educators rule out media development (Mujtahid, Berlian, Vebrianto & Thahir, 2021). Many activities are used to replace the role of media in the learning process, but educators often complain about the low problem solving in the classroom so that the knowledge given is only stored in short-term memory (Naimnule, Kartono & Asikin, 2020).

A good strategy needs to be prepared by educators in order to clearly define the material to maximize learning media (Febriyanto, Haryanti & Komalasari, 2018). The use of learning media is very important, because students at the basic level are still in the concrete operational stage (Juwantara, 2019). Students must be able to think logically through objects in the surrounding environment (Kurniasari, Sasmiati & Haenilah, 2018). Learning activities are not simply carried out without factors that cause someone to be encouraged to do so (Subahri & Fajri, 2019). Educators do not need to hesitate in using booklet media (Mahsun & Koiriyah, 2019).

Booklet is a paper print media that is combined into one and then developed according to the needs of the maker. Booklet products are also called integrated communication in providing learning materials (Pratiwi, Bintartik & Putra, 2020). Studies in booklet media aim to promote, invite or teach an important information in the scope of the workspace, health sector and sector education (Istiqomah, 2020). Booklet media can be used to convey messages in the form of books containing a collection of images and writings that have been systematically arranged in booklets used to achieve the goals of the reader (Fitriasih, Ansori & Kasrina, 2019).

The creation of a product booklet begins with creating a media design, instructions for use of the media, analyzing the material in the relevant media. Responses in the form of suggestions and criticisms are needed to improve the product developed. The thinking framework is then described as follows:



picture 1. Main Mapping Booklet

Educators through several pictures, writings or printed books packaged in several lesson problems begin to present lessons on material that has been prepared using booklet media as a solution to students' critical thinking problems. The problem-solving process in the form of understanding, planning, implementing and solving problems is called problem solving. The ability to remember and dare to refute the information conveyed by educators is an indication of success in providing motivation to students. Motivation is important in determining the achievement of learning goals (Jamil, 2019). Understanding between students is different, therefore educators can also go around demonstrating learning media (Saputro, Hartono, Irvandi, Nurmaningsih, Oktaviana, Susiaty & Ardiawan, 2020). The development of the times makes learning media must be prepared to help implement strategies that have been compiled into the teaching and learning process, making it easier for educators to minimize low learning outcomes in the material presented (Mawardi, Iriani & Daryati, 2019).

Students are more enthusiastic when given a stimulus in the form of a media booklet because it is influenced by the teacher's teaching skills in stimulating students who have low learning outcomes in a learning (Suswandari, 2021). Learning is a structured teacher activity in instructional design as an active acceleration of learning outcomes that emphasizes the provision of learning resources. Learning outcomes are changes in overall behavior and abilities possessed by students after the learning process. Changes that occur in students indicate the level of understanding gained during learning.

Learning outcomes are written using special symbols according to the agreement of each institution in each school. The result of learning is the appearance of good achievements in the material taught. The level of mastery of the material by students is categorized into several aspects, namely affective, cognitive and psychomotor. The basic ability that educators have in mastering mathematics in determining learning outcomes occurs when educators are able to understand students so that new synthesis arises in their minds. Mathematics comes from the foreign language mathanein or mathema which means "to learn or what to learn" (Nuryatni, 2019). The Netherlands as a country that once colonized the Indonesian state defines mathematics with the word "wiskunde", which is an exact science which is all related to reasoning (Hermawan & Anggiana, 2019). Mathematics is a study in the development of modern technology that plays a role in advancing human critical thinking (Saraswati & Agustika, 2020)

Critical thinking in mathematics involves numeracy and literacy that already exist in human life, namely at the basic education level (Perdana & Suswandari, 2021). Mathematics lessons are important lessons because they are tested nationally based on the curriculum in Indonesia before the graduation process (Pratiwi, 2019). The calculations taught by educators in elementary school relate to objects that exist in everyday life. Numeracy according to terms is the ability to analyze a mathematical concept in solving everyday problems. Numeracy is related to literacy in analyzing information in the form of graphs, tables and charts to make decisions on the problems faced (Khakima, Marlina & Az Zahra, 2021).

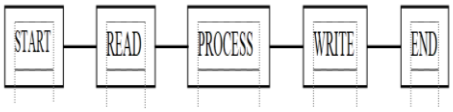
The majority of educators agree that mathematics is a subject that has a high level of difficulty so that it has an impact on learning outcomes (Ningsih & Hayati, 2020). The knowledge possessed by peseta didik is

limited so that educators provide a stimulus to improve the critical thinking of students so that they develop more in the future (Asmar & Suryadarma, 2021). The ability of educators to design teaching materials in the form of small books aims to improve mathematics learning outcomes, but mathematics has a variety of discussions such as the problem of declining learning outcomes making educators continuously always look for solutions to overcome it.

2. METHOD

The research used is research and development with ADDIE theory. The theory is carried out with five research steps in the form of analysis, design, development, implementation and evaluation (Agustin, Umamah & Sumarno, 2018: 20). Planning activities are carried out by setting and defining clear goals in a development (Rochmad, 2012: 62). Researchers carried out these five steps thoroughly by validating 9 expert validators consisting of 3 media experts, 3 linguists and 3 material experts.

Data collection is carried out using questionnaires and suggestions from validators to increase the quality of booklet media. The questionnaire assessment score collected from the fifth grade is an analysis of the effectiveness of the media booklet. Quantitative data analysis was carried out using the spss application as well as designing a media booklet sourced from the flowchart below:



Picture 2. Flowchart Booklet

Information:

Start contains the initial cover design, read is an introductory instruction about the booklet, process is an activity in accordance with the research objectives, write is an instruction on the results of the activity through the evaluation process and the end is useful for ending the desired problem solving program.

3. RESULTS AND DISCUSSION

3.1 Results

Research on booklet media through clear and conceptual analysis, design, development, implementation and evaluation. The stages of the research can be seen in the following explanation:

a. Analysis

The field analysis was carried out on Monday, January 10, 2022, when researchers met the class teacher at MIN 2 Tulungagung. Some conversations started with a simple question that finally obtained information that mathematics learning in the fifth grade must be completed immediately because of the implementation of the class increase process, coupled with the decline in their critical thinking power after the covid 19 pandemic outbreak. The researcher then conducted another interview with the principal about the veracity of the information just obtained.

His experience as a principal made him understand the geography and psychology of the students. The correctness of the data through interviews that have been obtained by researchers is justified by the principal, this is related to the material of building flat and building spaces that are difficult to develop through the digitization of cellphones which has been done by teachers by only making google form questions, zoom meetings and other platforms. The principal hopes that researchers can create a medium that can be seen, held and tried directly by students, especially those in grade 5.

After field analysis, the next step that researchers take is to create a flowchart that can facilitate media design to produce the desired product accurately. Media creation refers to the diagram of the researcher's analysis results after conducting a field analysis at MIN 2 Tulungagung. The media with a total of 10 pages has been completed, but due to limited costs researchers only print one to be validated to experts. The first expert the researcher met was a media expert. The search for a media expert is not only through advice from supervisors, but researchers have the initiative to find validator backgrounds through google schoolar, sinta and doaj applications. Researchers look at the bayground of validators so that the media to be analyzed is true from an expert, not just a lecturer who is not an expert. A man is said to be an expert as seen from the work he has and the quality and quantity of writing he has made during his lifetime. Although it is difficult to detect all the works that have been created, it can still be learned how to search for them through the application youtube, google or peers.

b. Design

The editing process is carried out using Microsoft World because researchers are not yet very proficient with other applications. Editing lasted for three months, this is because researchers have never edited a booklet with a large number of pages. It should be noted that every night the researcher is only

able to construct two pages of knowledge in his mind. The process runs from January to March. Here is the cover of the media booklet:

Picture 3. Booklet Beginning Cover

Researchers made a booklet cover design by taking pictures of books and trees, but media validators criticized that it is not appropriate for mathematics lessons to have pictures of trees so that the cover is changed to a flat wake and build a space as follows:

Picture 4. Booklet End Cover

c. Development

The media booklet was developed based on all inputs from experts who have supported the development research from researchers. All inputs, criticisms and suggestions have been accommodated in their entirety so that the media booklet can be improved before being tested in fifth grade. The media booklet, which was previously just a paper pasted on a small book, has now begun to be developed and refined into a pocket book with a content of flat building and building space materials and various other explanations so that students can easily understand it independently.

d. Implementation

The research process takes place continuously, namely the researcher provides a finished media design model and then revises it, the next day the researcher must come again and bring the revised media can be in the form of ordinary print out without being laminated. And so on until the media is really ready to be used as research at the bottom level. It is the hope of validators that the perfect media can be mass-produced by showing it to the KEMDIKBUD (Ministry of Education and Culture) or KEMENAG (Ministry of Religious Affairs). The time required during the analysis process is 4 days from 25 to 28 April 2022. The results obtained are then calculated into the following quantitative process:

$$P = \frac{\sum R}{n} x\ 100\%$$

$$P = \frac{3+3+3+3+2+3+3+2+3+3+2+3+3}{52} \text{ x } 100\%$$

$$P = \frac{36}{52} \text{ x } 100\% = 69{,}2\%$$

The purpose of spreading validator questionnaires is to get suggestions that will be analyzed by researchers and criticisms to improve the media to be tested and increase the knowledge possessed by researchers so as not to be proud of all professions that are being carried out. Data that has been carried out media feasibility tests show the average percentage results as follows:

Table 1. Recapitulation of Validator Values

No.	Validator Name	Specialties	Valuation
1.	Dr. Agus Purwowidodo, M.Pd.I.	Learning Technology	88,4%
2.	Prof.Dr.Ngainun Naim, M.H.I.	Professor of Islamic Methodology Education	92,3%
3.	Dr. H. Abdul Aziz, M.Pd.I.	Islamic Education technology	92,3%
4.	Prof. Dr. Mohamad Jazeri, M.Pd	Professor of Indonesian Language Education	90,6%
5.	Prof. Dr. Hj. Binti Maunah, M.Pd.I.	Professor of Sociology of Education	93,7%
6.	Dra. Siti Zumrotul Maulida	admin Journal of	87,5%

		Mardilanguage	
7.	Dr. Maryono, M.Pd	linear algebra	82,6%
8.	Dr. Ummu Sholihah, S.Pd., M.Si.	discrete mathematics	69,2%
9.	Dr. Muniri, M.Pd.	Algebraic Mathematics	69,2%
Sum		765,8	
Maximum score		900	
GraphicIty Due Diligence Average		85%	

The variance in this development research is all grade 5 learners. The total population in the school is 84 which is divided into three classes, namely 5A, 5B and 5C. Researchers then gave pretest questions on May 11, 12 and 13, 2022. The data of each class in the pretest test is as follows:

Table 2. Pre-test Test Results

No.	Class 5A	Value	Class 5B	Value	Class 5C	Value
1.	Faza	52,6	Afika	63,1	Rosyid	73,6
2.	Ani	57,8	Safana	68,4	Rijal	63,1
3.	Anisa	68,4	Akmal	73,6	Syifa	57,8
4.	Bayu	57,8	Akma	78,9	Samara	52,6
5.	Cindi	63,1	Alip	63,1	Dandi	57,8
6.	Dadang	68,4	Alfinda	52,6	Fita	57,8
7.	Rana	73,6	Bilal	52,6	Dita	52,6
8.	Nada	73,6	Kalista	57,8	Elisia	63,1
9.	Faris	63,1	Dafa	52,6	Intan	52,6
10.	Nanda	73,6	Akhdan	63,1	Aya	73,6
11.	Fionda	68,4	Indri	57,8	Maya	78,9
12.	Fiondi	63,1	Citra	73,6	Marsel	52,6
13.	Zila	52,6	Lutfi	63,1	Ihsan	47,3
14.	Zakiya	47,3	Alfi	63,1	Azriel	57,8
15.	Irfan	57,8	Ridho	73,6	Farhan	52,6
16.	Ami	52,6	Reza	52,6	Fatir	63,1
17.	Zen	63,1	Laras	57,8	Ridho	52,6
18.	Najib	57,8	Dica	57,8	Udin	47,3
19.	Rizki	57,8	Fatih	52,6	Andi	68,4
20.	Robby	57,8	Adam	63,1	Niko	68,4
21.	Fino	68,4	Kerisna	52,6	Fira	57,8
22.	Najma	68,4	Nabila	52,6	Rahel	63,1
23.	Nindi	63,1	Nanda	68,4	Liya	68,4
24.	Putri	57,8	Nadin	63,1	Tiara	73,6
25.	Safina	47,3	Fiki	52,6	Riska	78,9
26.	Fira	63,1	Bela	47,3	Fiki	63,1
27.	Silvi	57,8	Farizi	57,8	Zakia	73,6
28.	syifa	73,6	Zehan	52,6	Samara	68,4

After completing the pretest test, the researcher continued to test postes by giving treatment in the form of giving booklet media to all grade 5 students.

Table 3. Homogeneity Test

Levene Statistics	df1	df2	Sig.
,791	2	81	,457

Based on the table above, it is known that the significance value of mathematical result variables in students in grades 5A, 5B and 5C is 0.457. Since the Significance value is 0.457 > 0.05, the data on the pretest class are homogeneous.

Postes tests were conducted on May 17, 18 and 19. Students respond to the booklet media with great enthusiasm so that the delivery of mathematical material is carried out smoothly and conducively. The following are the results of the postes test which are then included in the calculation of the normality test. Data normality is an absolute requirement that must be met immediately after conducting a homogeneity test. Here are the values of the postes:

Table 4. Post-test Test Results

No.	Class 5A	Value	Class 5B	Value	Class 5C	Value
1.	Faza	57,8	Afika	63,1	Rosyid	73,6
2.	Ani	68,4	Safana	73,6	Rijal	63,1
3.	Anisa	63,1	Akmal	73,6	Syifa	63,1
4.	Bayu	73,6	Akma	84,2	Samara	52,6
5.	Cindi	84,2	Alip	84,2	Dandi	63,1
6.	Dadang	94,7	Alfinda	57,8	Fita	63,1
7.	Rana	100	Bilal	57,8	Dita	57,8
8.	Nada	84,2	Kalista	84,2	Elisia	68,4
9.	Faris	78,9	Dafa	57,8	Intan	73,6
10.	Nanda	100	Akhdan	89,4	Aya	78,9
11.	Fionda	68,4	Indri	57,8	Maya	84,2
12.	Fiondi	57,8	Citra	78,9	Marsel	57,8
13.	Zila	52,6	Lutfi	68,4	Ihsan	52,6
14.	Zakiya	63,1	Alfi	68,4	Azriel	57,8
15.	Irfan	63,1	Ridho	78,9	Farhan	63,1
16.	Ami	89,4	Reza	57,8	Fatir	73,6
17.	Zen	89,4	Laras	84,2	Ridho	57,8
18.	Najib	63,1	Dica	68,4	Udin	52,6
19.	Rizki	73,6	Fatih	73,6	Andi	68,4
20.	Robby	84,2	Adam	89,4	Niko	73,6
21.	Fino	100	Kerisna	57,8	Fira	63,1
22.	Najma	89,4	Nabila	57,8	Rahel	63,1
23.	Nindi	73,6	Nanda	68,4	Liya	68,4
24.	Putri	68,4	Nadin	68,4	Tiara	73,6
25.	Safina	52,6	Fiki	52,6	Riska	78,9
26.	Fira	68,4	Bela	52,6	Fiki	63,1
27.	Silvi	57,8	Farizi	63,1	Zakia	73,6
28.	syifa	78,9	Zehan	52,6	Samara	73,6

Based on the postes data above, the researcher then included it in the spss calculation which resulted in the following data:

Table 5. One-Sample Kolmogorov-Smirnov Test

		Class A	Class B	Class C
N		28	28	28
Normal Parameters[a.b]	Mean	74,9536	68,7429	66,2929
	Standar Deviation	14,66547	11,81730	8,51617
	Absolute	,137	,180	,182
	Positive	,137	,180	,182
	Negative	-,093	-,119	-,162
Kolmogorov Smirnov-Z		,724	,952	,962
Asymp. Sig (2 tailed)		,671	,352	,313

The first table contains descriptive statistics from the data that have been calculated in the form of the total number of samples, namely 84, as well as the standard deviation along with the standard error mean. Next is a table on the relationship between pretes and postes as follows:

Table 6. Paired Sample T- Test

		N	Correlation	Sig.
Pair 1	Pretes & postes	84	,644	,000

The table above shows the relationship between pretes and postes due to their significance of 0.000 < 0.05. It is necessary to know that the condition of decision making is to look at the significance value of two tailed, if the significance value is less than 0.05 then there is a meaningful influence on the treatment given to each variable.

e. Evaluation

After the development of the media booklet along with all the tests that have been described in the discussion above, researchers found several things, including that students are able to learn independently when the media provided by the school is flexible and not easily damaged as the design of the media booklet has been carried out various kinds of tests so that the media can be really both in terms of quality and quantity, Critical thinking can be measured using observations and statistical test analysis, but all of these can have an effect when students get a reward when they correctly answer the questions given by educators.

The application of media booklets is also supported by methods carried out by educators, this is used so that media that has been validly tested by experts can be implemented into the teaching and learning process pleasantly and does not leave the purpose of implementing learning. Learning objectives can be viewed on the learning tools that have been compiled. Media booklets can help improve learning outcomes according to the purpose of learning on the material in the media booklet, it needs further development so that there is a lot of material so that the critical thoughts of students can be better processed for learning in the present or future.

3.2 Discussion

a. Media booklet design based on expert input

The initial part of the media booklet was revised based on the advice of the supervisor. He suggested that the media is not just paper pasted, but rather refers to the process of typing electronically on a laptop which can later be propagated through printing. Furthermore, the researcher looked for a small book as a reference and continued to design it very creatively. After guidance, it turned out that the design was not so attractive because it was difficult to find a printing house that could multiply such a booklet model. One month has passed from January to early February, finally researchers added to the contents of the booklet with several pop ups that can be seen, held and demonstrated by students. Pop ups according to researchers are an additional medium to a book formed from paper with a three-dimensional feel. After it was felt that enough of what the researcher did was to design the cover using Microsoft Word which would later be re-edited by the printing company. To be honest, researchers are not yet proficient in applying corel draw, photoshop or the like coupled with laptops that do not meet the specifications because the age of old laptops makes researchers take shortcuts by editing them manually using makeshift applications.

Researchers are interested in adding photos of educators from MIN 2 Tulungagung to the media booklet, but this is not allowed by experts. They think that adding photos of living things to the book must be licensed and must be in accordance with the theme of the material to be studied. Experts also suggest that the booklet media will not only be printed and tested in MIN 2 Tulungagung, but can obtain IPR (Intellectual Property Rights) that can be exposed nationally using different languages. Every word and sentence that is put into the media booklet must be charged with problem solving so that students can learn it independently without any coercion, pressure and obstacles in reading it. The distance between the spaces must also be the same, excessive coloring will result in the reading focus of the learners becoming wider and unable to capture the content of the material presented.

The table of contents of the media booklet is not allowed to use many irrelevant images. This is because the page number to be addressed by the reader becomes unattractive and the critical thinking process cannot be carried out optimally. Through these various inputs, the researcher finally changed the total media of the booklet starting from the cover to the content in it to be more specific. It can be seen in the twelfth revision picture that a lot of empty space is supposed to be filled with material about flat building and space building, but researchers did not design it. After a long analysis, it was finally replaced with a caricature image of a child holding a blackboard. However, the image of the illustration is too large and less attractive coupled with the content of the problem solving that should exist is lost because the illustration interferes with the reader's concentration.

b. Media Booklet Eligibility

In the third month, in March 2022, researchers redesigned the overall appearance of the cover and the contents of the media booklet. After feeling tired, researchers tried to venture to find many expert lecturers who were indeed qualified in providing input, criticism and suggestions in terms of scientific work and media editing. This is not to compare the supervisor with the lecturers, but to add input in improving the media booklet to be more perfect. Researchers submitted 12 lecturers ranging from extraordinary lecturers, permanent lecturers, doctors and professors as input providers, but not all of them wanted to give advice because they were busy in their respective affairs and researchers did not understand the specifications owned by the lecturers so they preferred to advise other lecturers to assess being validators from the media booklet.

c. Application of media booklets in grade 5

After successfully completing all the challenges of making a media booklet, researchers conduct many tests such as validity, reliability, homogeneity, normality and paired differences sample t test tests. The significance value of two tailed 0.000 less than 0.05 indicates a significant difference between students who have not previously been treated with the use of booklet media with the learning process using media that has been made by researchers.

In the initial test, namely three media expert validators, three linguist validators and three material expert validators, 84.7% stated that the media booklet design was very valid and 84 samples in the reliability test in chronbach's alpha table were 0.899 > 0.60 with valid specifications and could be tested. The application of booklet media was analyzed using pretest questions through a homogeneity test of 0.457>0.05 which means homogeneous and a kolmogorov smirnov normality test in the postes class of 0.962>0.05 with normal distribution and can be applied in class 5.

d. The effectiveness of problem solving booklet media in improving mathematics learning

Hypotheses need to be given to test whether there is an effectiveness of the treatment of providing media booklets to students. More details are as follows:

H0 = media booklet able to improve mathematics learning outcomes

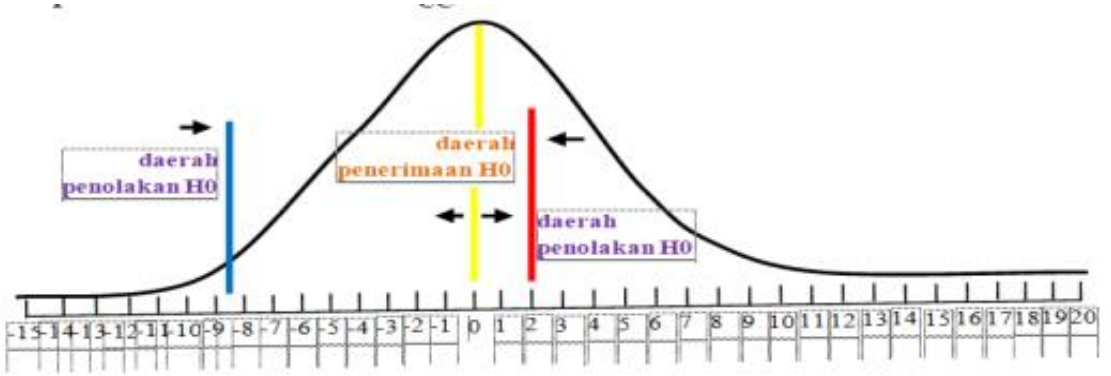
Ha = media booklet is not able to improve mathematics learning outcomes

The basis for decision making in the one sample t test is carried out in three ways, namely comparing the Sig value (significance) with 0.05, then comparing the t_hitung value with t_tabel or looking at the comparison of the t_hitung value with the t_tabel using curves.

Measuring the effectiveness of booklet media development through paired sample t-test by comparing the effect of booklet media development before testing and after based on the decision that has been tested is if the sig value. (2-tailed) < 0.05, then H0 is rejected, it is different when the sig. (2-tailed) value > 0.05, then H0 is accepted. Based on the decision that has gone through the paired sample t-test test, a significance value of 0.00 < 0.05 was obtained, then in accordance with the basis for making the decision above, H0 was rejected. The data means that there is an influence on the effectiveness of critical thinking in the booklet media so that it can improve student mathematics learning outcomes. The second comparison is to use t_hitung value with t_tabel. The basis for its decision-making is as follows:

If the value t_hitung > t_tabel, then H0 is rejected,

If the value t_hitung < t_tabel, then H0 is accepted.



Picture 5. Booklet media effectiveness curve

Lookup of values t_tabeladalah 0.05/2; df = 0.025;83. The researcher then looked at the distribution of t_tabelstatistik values, then found a t_tabelsebesar value of 2.71. The data that has been found is then entered into the basis for decision making, namely -8,323 < 2.71, so that H0 is received.

4. CONCLUSION

Research has produced a product in the form of a small book in the form of a pocket book with the name of a mathematics booklet intended for elementary students. The materials available in the main menu of the media booklet are continuously based on the advice of experts. The media booklet was developed using the ADDIE model, namely analysis, design, development, implementation and evaluation. The constructivistic theory of LevVgotski that underlies its existence is in the form of a clear problem to be solved and grow from students according to their level of ability. The problem seen based on observations, interviews and student response tests is the low mathematics scores of students even though there are various kinds of clues on the material of building flat and building space.

The results showed that: 1) three media expert validators, three linguist validators and three material expert validators were 85% with very valid categories. 2) 10 samples in the reliability test in Chronbach's Alpha table, namely 0.716 > 0.60 with specifications suitable for use and student responses to the distribution of 92.7% questionnaires with practical specifications and effective in terms of appearance. 3) The application of the media booklet was analyzed using pretest questions through a homogeneity test of 0.457>0.05 which means homogeneous and a kolmogorov smirnov reliability test of 0.962>0.05 with normal distribution and can be applied in class 5. 4) Measuring the effectiveness of media booklet development through a paired sample t-test with SPSS, namely 0.00<0.05 so that there is an influence on the effectiveness of critical thinking in improving student learning outcomes.

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