Development of Mind Mapping Pocket Book in Quadrangular Materials to Improve Self Regulated Learning of Grade VII Junior High School Students

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Development of Mind Mapping Pocket Book in Quadrangular Materials to Improve Self Regulated Learning of Grade VII Junior High School Students

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Abstract: This research is a development research that aims to determine the validity, practicality, effectiveness of learning media using mind mapping pocket books in quadrangular material to improve self-regulated learning of class VII students of SMP Negeri 7 Madiun. The type of research used in this study is Research and Development (R&D) with the ADDIE model which consists of five steps, namely: 1)analyze, 2)design, 3)development, 4)implementation, and 5)evaluation. The research subjects consisted of two types, namely the limited test subjects with 6 students from VII-B class and field trial subjects with 32 students from VII-G class. The research instruments used were learning media validation sheets (validity aspects), student response questionnaires (practical aspects), learning outcomes tests (effectiveness aspects), N-gain tests (increased self regulated learning) The results of this study were: 1) Learning media mind mapping pocket books in quadrangular meet high validity criteria with an average value of 88.89%, 2) pocket book learning mind mapping media in quadrangular meet high practicality criteria with an average value of 4.28 in limited trials and 4,21 in field trials, 3) mind mapping pocket book learning media in quadrangular material fulfills the effectiveness criteria percentage of students completing learning by 93.75%, and 4) Pocket book mind mapping learning media on quadrangular material can improve self regulated learning students with the results of the N-Gain average of 70.49.
Keywords: Pocket Book, Mind Mapping, Self regulated Learning, and Quadrangle

1. Introduction

Mathematics is one of the subjects in junior high school which is still considered difficult by students, because mathematics requires students to understand the concepts and formulas in them. Mathematics emphasizes concepts, which means that in learning mathematics students must understand concepts in order to solve problems and be able to apply them, this was stated [1]. One of the topics that require understanding of concepts is rectangular flat structure because in the subject there are many shapes that are almost similar such as rectangles, squares, parallelogram, rhombus, kites, and trapezoid. Difficulties experienced by students in learning mathematics because the learning process takes place more with the lecture method than using learning media. The use of instructional media has an important meaning in the learning process because the ambiguity conveyed by the teacher can be assisted with learning media as an intermediary tool [2].

Almost every learning situation involves media that include verbal and visual information, such as texts and pictures that must be continuously analyzed and processed by learners [3]. Moreover, in order to reach a learning goal, this information needs to be integrated into a coherent mental model and stored in long-term memory [3], [4]. Learning media that can be developed for students at the junior high school level are books because there is still a lack of reference books. The availability of interesting and practical book references will make it easier for students to learn independently. One practical and interesting learning media is a pocket book. A pocket book is a small book containing information that

can be stored in a pocket so that it is easy to carry and easy to read [5]. The presentation of the pocket book uses a lot of pictures and colors so as to provide an attractive appearance for students to learn independently [6].

According to the international research, several studies have concluded that mind mapping has good performance in motivating students' thinking development, especially in the development of innovative thinking [7]–[9]. Futhermore, The mind map combines the concepts of the whole brain which includes the logic, sequence, ordinances, words and numbers of the left brain, and the image, imagination, color, space, and the whole of the right brain [10]. So, the mind mapping method can be applied into a pocket book so that it can be used as one of the methods used to optimize student brain function and serve as a reference for learning independently. Small pocket books will make it easier for students to learn. Then an interesting and conceptual presentation that uses mind mapping will also increase student learning independence. The learning independence also determines the success of students in learning and shows a positive influence on learning and the achievement of learning outcomes [1].

Based on the description and analysis of the problem above, the researcher is interested in conducting a study entitled " Development of Mind Mapping Pocket Book in Quadrangular Materials to Improve Self Regulated Learning of Grade VII Junior High School Students "

2. Research Method

This type of research used by this research is research and development (Research and Development). This study aims to create and develop a product in the form of print learning media. The learning media developed in this study were mind mapping based learning media on quadrilateral for VII grade students of SMP Negeri 7 Madiun in the 2018/2019 school year.

The development model used in this study is the ADDIE model. ADDIE is a development model with a systematic design model. In line with the opinion that the ADDIE model is a model that is arranged systematically with a sequence of activities that are structured in an effort to solve learning problems related to learning resources that are appropriate to the needs and characteristics of students[11].

The ADDIE model consists of five steps, namely:

2.1 Analyze

The analysis phase aims to determine the need for the development of instructional media. At this stage a preliminary study is carried out observation of the conditions of learning facilities, teachers and students. Preliminary research obtained several aspects of needs analysis, namely the curriculum used in schools, learning that takes place in class, learning resources or learning materials used in schools, the use of instructional media, student enthusiasm for learning mathematics, and the condition of the school environment.

2.2 Design

The design phase is the planning stage of a learning media framework that aims to prepare a prototype of a learning device. This stage consists of 3 steps, namely 1) preparation of instruments in the form of instrument validation sheets, media validation sheets, student response questionnaire sheets, learning achievement test questions sheets, 2) selection of learning media, and 3) initial design of learning media.

2.3 Development

The development phase includes validation of mind mapping pocket learning media to three validators. From the results of the validation, the researcher will improve the learning media of the mind mapping pocket book according to the suggestions from the validator and produce a final product that will be tested on students.

2.4 Implementation

The implementation phase consists of a small group trial with the subject of 6 students of class VII B. At this stage the learning media will be implemented with 6 students. Then in the end of learning students will be given a response questionnaire to assess the learning media of the mind mapping pocket book and provide constructive advice.

2.5 Evaluation

The Evaluation Phase consisted of large group trial activities with 32 students of Class VII G as well as data analysis in the form of:

2.5.1 Validity Analysis of Learning Media

The reference used to determine the level of validity of Android-based HOTS LKS adopts the data analysis formula proposed as follows:

$$V = \frac{TSh}{TSe} \times 100\%$$

Description

V : Percentage of validity

TSe : Total empirical score (maximum number of scores)

TSh : Total expectation score (number of assessment scores by validator)

This research and development involve 3 experts as validators. So to find out the overall percentage, the researcher calculates the combined validity with the following formula:

$$V = \frac{V_1 + V_2 + V_3}{3} = \cdots \%$$

Table 1. Criteria Validity

Criteria Validity	Level Validity
85,01% – 100,00%	Very valid, or can be used without revision
70,01% – 85,00%	Quite valid, or can be used but needs to be revised small
50,01% – 70,00%	Less valid, it is recommended not to use because it needs a large revision
01,00% – 50,00%	Invalid, or may not be used

In this study, the validity criteria in the range of 70% – 85% as the minimum validity limit of mind mapping pocket book.

2.5.2 Practical Analysis of Learning Media

The practicality test of learning mind book pocket media is done by giving questionnaires to students. Questionnaire practicability of learning media consists of a range of scores between 1 to 5. The score consists of 5 types of options namely Strongly Disagree (STS), Disagree (TS), Neutral (N), Agree (S), and Strongly Agree (SS). Scoring the answer options pay attention to the statements contained in the questionnaire. The statements in the questionnaire consist of two forms, namely positive statements and negative statements. The total score which is the result of assessment by students is then presented to determine the level of practicality.

Formulated a formula to process the results of the fundamental practical results as follows [13]:

1. Determine the average of all respondents for each criterion:

$$I_{sj} = \frac{\sum_{i=1}^{n} \sum_{j=1}^{m} S_{ij}}{n}$$

2. Determine the value of practicality

$$P = \frac{\sum_{j=1}^{n} I_{sj}}{m}$$

3. Description:
   I_{sj} = The average score of all students for criteria to *j*
   S_{ij} = Score of the students to i against the criteria to *j*
   P = Final practicality value
   n = many students
   m = many criteria

Practicality test is carried out using the results of questionnaire responses of students and analyzed using practical criteria according to Hobri [14] shown in the following table:

Table 2. Practicality Criteria

Practicality Criteria	Practicality Limit
P = 5	Very High
4 ≤ P < 5	High
3 ≤ P < 4	Medium
2 ≤ P < 3	Low
1 ≤ P < 2	Very Low

In this study, researchers refer to the practicality criteria above and set the practicality criteria in the range of 3 ≤ P <4 as the minimum practicality limit.

2.5.3 Analysis of the Effectiveness of Learning Media

Mind mapping learning media book on quadrilateral flat material can be said to be effective if 80% of students meet mastery learning. The completeness was obtained from the posttest conducted by students after trying the mind mapping learning media. Data on the results of the test answers were analyzed and their values determined [15].

2.5.4 Improved Analysis of Self-regulated Learning

To find out the increase in students' self-regulated learning after using mind mapping based learning pocketbook media is done by using a test result sheet through pretest and posttest.

In this analysis used the calculation of Normalized Gain or N-Gain with the formula according to (Sundayana, 2010) namely:

$$N - Gain = \frac{Skor\ Postest - Skor\ Pretest}{Skor\ Maks - Skor\ Pretest} \times 100$$

The normalized Gain score results are divided into three categories according to (Sundayana, 2010), namely:

Table 3. N-Gain Criteria

Precentase	Classification
N-gain > 70	High
30 ≤ N-gain ≤ 70	Medium
N-gain < 30	Low

In this study, the researcher refers to the N-Gain Categories above and sets the improved of self-regulated learning in the range of 30 ≤ n-gain ≤ 70 as the minimum improved of self-regulated learning.

3. Results and Discussion

Research on developing mind mapping pocket learning media was developed for seventh grade junior high school students. In the development of these media students understand various things related to rectangular flat shapes. This learning media can make it easier for students to understand concepts and easily distinguish each type of rectangular flat figure. Learning media can be said to be feasible to use if it meets four development criteria, namely valid, practical, effective, and able to improve students' self-regulated learning. The following is an explanation of the three criteria:

3.1 Validity of the Mind Mapping Pocket Learning Media

Learning is said to be valid if the combined validation scores of the three validators get results> 70% [12].The percentage of final validation by the validator of mind mapping pocket learning media showed 88.89% results with very valid criteria so that the developed learning media could be used as an alternative learning resource in mathematics learning.

Table 4. Validation Analysis of Learning Media by Aspect

No	Rated Aspect	Percentase	Criteria
1	Material	90.00	Very valid
2	Presentation	87.62	Very valid
3	Linguistic	90.00	Very valid

This is in line with research [16] which states that the Development of Science Friends' Pocket Book on Hearing Sensing Materials and Sonar Systems in Middle Schools based on validity aspects in terms of the implementation of learning meets valid criteria by media experts who obtain an average percentage average of 81% with very valid criteria and can be used in learning.

3.2 Practicality of Learning Media Mind Mapping Pocket Book

Learning media are said to be practical if they meet the criteria for a range of 3 ≤ P <4 values for students who give positive responses. This is in line with research (Saputro, 2011) that positive student responses to each statement in each aspect are said to be positive and the percentage of student responses to statements contained in each aspect has a range of 3 ≤ P <4. The results of the questionnaire responses of six students in the limited trial P = 4.28, which means that the level of practicality is high. Meanwhile, the results of the 32 student questionnaire responses in the field trials obtained a value of P = 4.21, which means that the practicality level of learning media for mind mapping pocket books is high. The range of questionnaires for each indicator in the field trial is as follows:

Table 5. Analysis of Student Response Questionnaire by Indicator

No	Indicator	Range Value	Criteria
1	Mathematics learning before and after using mind mapping pocket book learning media	4.20	High
2	Application of mind mapping pocket book learning media	4.24	High
3	The component of mind mapping pocket book learning media	4.20	High

From table 5 it can be concluded that student responses to the mind mapping pocket learning media have high criteria. In addition there is student interest in the learning process that is seen from students more happy and easy to understand the subject of quadrilateral building through the mind mapping pocket book provided. With mind mapping can make it easier for students to store information, organize information, make priorities, learn to understand information in its context, and remember full information [17].

The mind mapping pocket learning media also has the advantage that students become brave to ask the teacher and between friends and discussions occur in learning. In line with the opinion [18] which states that the learning media will produce oral activities in the form of student activities to ask questions, give suggestions, express opinions, interview and discuss together.

3.3 The effectiveness of the Mind Mapping Pocket Book Learning Media

Learning tools are said to be effective if the percentage of students completeness learning ≥ 80% is classically. The number of students who showed mastery learning was 30 students out of 32 students or showed a percentage of mastery learning at 93.75%. This shows that the learning media of pocket mapping ming can be said to be effective.

This is in line with research [19] which states that the development of computer-based learning media for the Example Non Example model in Geometry material in junior high schools based on the effectiveness aspect in terms of the implementation of learning meets the effective criteria with an average percentage of 83.5 %. Learning media that have been developed are effective, so that the use of learning media can be used to achieve learning objectives.

3.4 Increased self-regulated learning

Ming pocket book learning media is said to be able to improve students' self-regulated learning if the N-Gain score from the pretest and posttest results reaches a range of 30 ≤ N-Gain ≤ 70 with a minimum limit. While the average N-Gain score of 32 students in the field test showed a score of 70.49. This shows that the mind mapping learning media can improve self-regulated learning and can be said to be effective with high criteria.

This is in line with research [20] which states that Research-Based Learning to Improve Creative Mathematical Thinking Abilities get an average N-Gain score of 41% with moderate criteria.

4. Conclusions and Suggestions

4.1 Learning media mind mapping pocket books in quadrangular meet high validity criteria with an average value of 88.89%

4.2 Pocket book learning mind mapping media in quadrangular meet high practicality criteria with an average value of 4.28 in limited trials and 4,21 in field trials

4.3 Mind mapping pocket book learning media in quadrangular material fulfills the effectiveness criteria percentage of students completing learning by 93.75%

4.4 Pocket book mind mapping learning media on quadrangular material can improve self regulated learning students with the results of the N-Gain average of 70.49.

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