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The Development of Mind Mapping Based-Electronic Pocket Book Media on Geometry Material of Fifth Grade of Sultan Fatah School Group Bonang Subdistrict Demak Regency

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Abstract: The purpose of this research is 1) to describe the results of the development of electronic pocketbook media based on mind mapping of geometry material, 2) to describe the eligibility level of mind mapping based – electronic pocketbook media on geometry material, 3) to describe the effectiveness of mind mapping based electronic pocketbook media geometry material on student learning outcomes. The design of this research is Research and Development (R and D) or development research with research stages 1) Preliminary Study; 2) Planning; 3) Initial Product Format Development; 4) Initial Trials; 5) Product Revision; 6) Field trials; 7) Product Revision; 8) Field trials; 9) Final Product Revision; and 10) Product Dissemination and Implementation. The study was conducted with 35 students from each class of fifth-grade students at Serangan 2 Elementary School as the experimental class and of fifth-grade students at Jatirogo Elementary School as the control class. The instruments used to collect data are interviews, questionnaires, learning achievement tests, and documentation. Testing the learning outcomes test instrument includes the validity of the question items, reliability, difficulty level test, and differential power test. Research result shows that (1) The development of a mind mapping-based electronic pocketbook media on geometry materials has gone through the planning, process, evaluation, product validation, product revision, and trial use of the product. (2) Based on the validation from material experts and media experts, it shows that the validation results of mind mapping-based electronic pocketbooks fall into the 'worthy' category, while the percentage of teacher and student responses to product trials for the use of electronic pocketbook media for geometry materials is the same. the same obtained a positive response of 100%; it means that mind mapping-based electronic pocketbook media of geometry material is feasible to be developed in learning. (3) Based on the results of the N-Gain calculations carried out to determine the increase between the pretest and posttest scores for the experimental class, the average value of the calculation results was 74.54%; meaning that the mind mapping-based electronic pocketbook media on geometrical material is effective enough to improve the learning outcomes of fifth-grade elementary school students.

Keywords: Electronic Pocketbook Media, Mind Mapping

1. Introduction

Learning is a process of changing behavior as a result of interaction with the environment in meeting their needs (Daryanto, 2010). Wittig (in Shah, 2003), states that learning is any relatively permanent change in an organism behavioral repertoire that occurs as a result of experience. Learning is a systematic and systemic activity and process consisting of several components: teacher, curriculum, students, facilities, and administration. Each component is not separate (partial) or running independently, but interdependent, must complement each other, and run regularly, and continuously. For this reason, it is necessary to design and manage to learn and use learning resources developed to achieve learning objectives.

Learning is no longer solely about change and discovery but includes skills resulting from the changes and discoveries. After experiencing change and discovering something new, a skill will emerge that will benefit life. Every learning situation has at least dynamic elements that must be considered for the success of teaching and learning activities,

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such as learning stimulus, attention and motivation to learn, responses to the material being studied, and the student's ability to learn.

Learning is a term that has a very close relationship and cannot be separated from one another in the teaching and learning process. Learning is done to create an atmosphere for students to learn. For this reason, how students gain knowledge from their learning activities must be understood. For example, in mathematics lessons, besides the interaction of students with educators, adequate teaching materials are also very important so that students are more motivated.

Mathematics is a very important subject; it can be said that mathematics in every educational institution is a subject matter that cannot be separated even in everyday life which cannot be separated from mathematics. However, there are several obstacles, namely the characteristics of abstract mathematics, problems with teaching materials, and problems with students or educators. It is known that the limitations of media and learning resources in students' mathematics learning are one of the problems in mastering mathematics material, especially geometric material. Then the learning resources used in the learning process are still monotonous, only coming from textbooks in schools and LKS owned by students.

The lack of textbooks or reference books owned by students as complementary books for learning causes a lack of insight into their knowledge, so students have difficulty finding concepts in the material. This also has an impact on the acquisition of student learning outcomes in learning mathematics which is still low.

Along with the rapid development of information and communication technology (ICT), a pocketbook that is made attractive with a variety of visual data that refers to a dynamic display with the concept of following the work of the brain in the form of a Mind Map is something that is needed. Even now all books can be electronically known as electronic or digital books.

2. Methodology

3.1 Research Design

This research is a type of research development or Research and Development (R&D). According to Sugiyono, (2022) Research and development (R and D) research functions to validate and produce certain products. To be able to produce certain products; needs analysis is used and research is needed to test the effectiveness and validity of these products so that they can function in the wider community.

3.2 Research Procedure

The development research procedure that will be used is to adapt research and development according to Borg & Gall (Sugiyono, 2018). The following is the development design

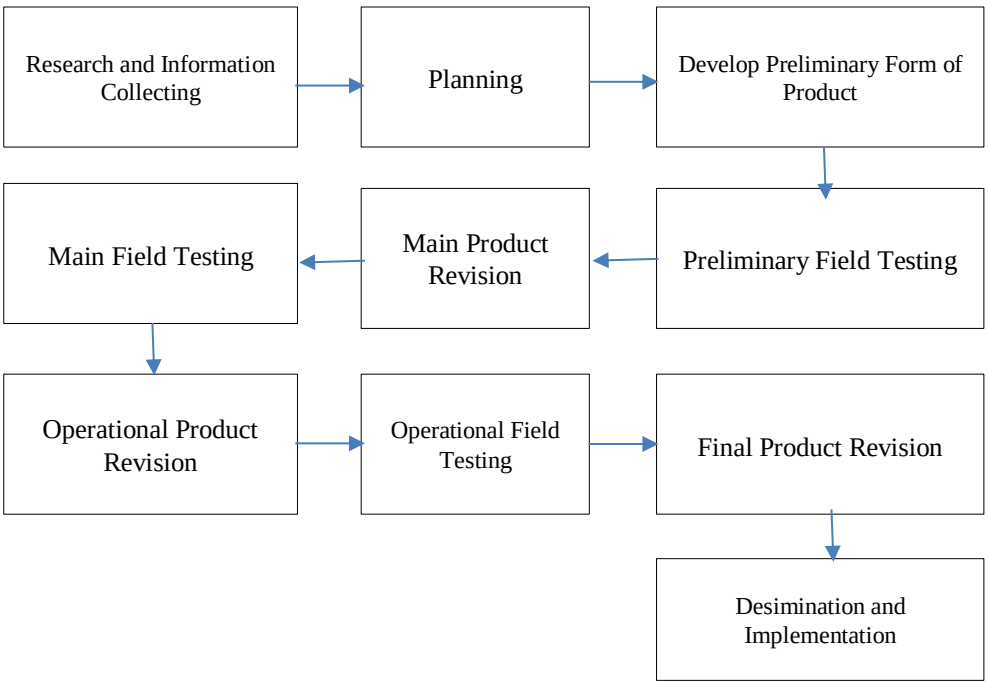


Figure 1. borg and gall development design

3.3 Data Collection Techniques

According to Sugiyono (2022) data collection techniques are the most important step in research, because the main goal of research is to obtain data. Data collection techniques can be done in several ways, including interviews (interviews), questionnaires (questionnaires), learning outcomes tests, and documentation.

3.4 Data Validity Test

3.4.1 Instrument Validity Test

In this study, the validity used is content validity. Sugiyono (2022) states that there are two kinds of instruments, namely instruments in the form of tests to measure learning achievement (results) and non-tests to measure attitudes.

3.4.2 Instrument Reliability Test

According to Hokins and Antes (Purwanto, 2018), reliability is expressed as the consistency of observations obtained from repeated recordings of either one subject or several subjects. Lestari and Yudhanegara (2017) state that reliability is the instrument's consistency when given to the same subject even though different people. So it can be said that a reliable instrument is an instrument that is used even though it is used several times to measure the same object, will produce the same data as well (Sugiyono, 2016).

3.4.3 Difficulty Level Test

The item's difficulty level (Lestari and Yudhanegara, 2017) describes how much the number of correct scores on the item concerned is relative to the total ideal score. A good question is neither too easy nor too difficult.

3.4.4 Power Difference Test

The differential power test (Arikunto, 2013) is the ability of a question to distinguish between students with high abilities and those with medium or low abilities. The number that indicates the amount of discriminating power is called the discrimination index.

3. Findings and Discussion

The scope of the results of this research and development includes: (1) the Development of electronic pocketbook media based on mind mapping; (2) The feasibility of mind mapping-based electronic pocketbook media, and (3) The effectiveness of mind mapping-based electronic pocketbook media..

4.1 Development of Mind Mapping-Based Electronic Pocket Book Media

4.1.1 Planning

The planning stage in this study consists of several parts, including results of needs analysis, development objectives, the scope of material, and the design developed.

4.1.2 Process

Development of electronic pocketbook media after planning is processed so that it becomes an effective and efficient electronic pocketbook media. In it, clear instructions are given so that students when studying at home without the help of a teacher can understand and complete them well.

4.1.3 Evaluation

The evaluation stage in the development design of the development of electronic pocketbook media contains the instructional impact on the application of electronic pocketbook media development implemented in elementary schools.

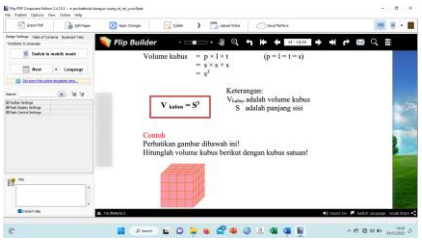
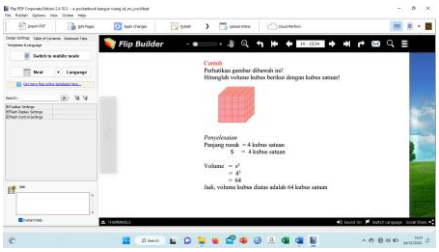
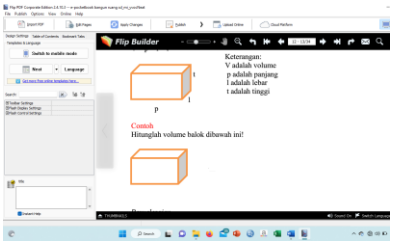
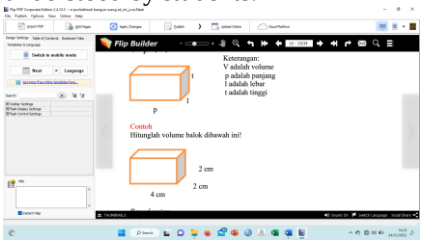
4.1.4 Product Validation

Table 1. Recapitulation of Expert 1 and Expert 2 validation results.

Expert/Validator	Obtain Percentage	Percentage Validity Level	Feasibility
I	85,00	80 % – 100 % Valid	Usable with minor revisions
II	82,50	80 % – 100 % Valid	Can be used without revision

4.1.5 Product Revision

Table 2. Results Development of electronic pocketbook media

No	Prior/Development Revision	After / Development Revision
1	 The display of electronic pocketbook images is less clear and less attractive	 The display of electronic pocketbook images is clearer and more attractive
2	 The sentence structure of the question statement/question sentence is not clearly understood by students.	 The sentence structure of the question statement/question sentence is easy/clearly understood by students.
3	 The sentence structure of the question statement/question sentence is not clearly understood by students.	 The sentence structure of the question statement/question sentence is not clearly understood by students.

4.1.6 Trial use (first product)

The researchers conducted a product trial from the results of expert validation and improvements made.

Table 3. Trial validity test results 1

Criteria	Amount	Question Item Number
Invalid	2	2, 27
Valid	28	1, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, 18, 19,20, 21, 22, 23, 24, 25, 26, 28, 30

4.1.7 Trial use (second product)

Through input from fellow teachers and experts, the results of the revision of the first product test were applied to the second trial.

Table 4. Trial validity test results 2

Criteria	Amount	Question Item Number
Invalid	0	-
Valid	30	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27 , 28, 30

4.1.8 Teacher and Student Response Questionnaire

Based on the teacher's questionnaire results, all questions with a total of 10 questions received a positive response (Yes) with a score of 2 and obtained a percentage of 100% in each aspect asked. This shows that the use of spatial electronic pocketbook media has received a positive response.

From the results of the student questionnaire, the results of the fifth-grade students' responses to the product trial on the electronic pocketbook media consisting of 10 indicators received ratings from 35 students, all indicators scored 35 with a percentage of 100%. This shows that the use of spatial electronic pocketbook media has received a positive response.

4.2 Media Feasibility of Mind Mapping-Based Electronic Pocket Books

4.2.1 Descriptive Statistical Data of Learning Outcomes

Learning outcomes in the form of pretest scores were obtained before students received learning using mind mapping-based electronic pocketbook media and posttest scores were obtained after learning. In the following, descriptive statistical data are presented on the pretest and posttest learning outcomes.

Table 5. Descriptive Statistical Data of Experimental Class Learning Outcomes

Measures	Average=	Highest Score	Lowest Score	Total Completed	Learning Completeness (%)
Pretest	44,57	63,33	20,00	0	**0%**
Posttest	**84,76**	**100,00**	**60,00**	**33**	**94,29%**

From the results of the pretest average number of students in the experimental class was 44.57 and the posttest average was 84.76. So that it can be seen that the average difference between the pretest and post-test scores is 40.19.

4.2.2 Normality Test

The normality test is used to determine whether the posttest value data in the experimental class and control class are normally distributed or not.

Table 6. Normality Test Results

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Class	Statistic	df	Sig.	Statistic	df	Sig.
Student	PreTest Eksperimen	.111	27	.200*	.954	35	.153
Learning	PostTest Eksperimen	.125	27	.182*	.938	35	.048
Outcomes	PreTest Kontrol	.112	27	.200*	.942	35	.066
	PostTes Kontrol	.116	27	.200*	.964	35	.307

4.2.3 Homogeneity Test

In this study, a homogeneity test was carried out to determine whether the results of the post-test scores between the experimental class and the control class had the same variance before and after being given different treatments. This homogeneity test is used as a supporting condition in the analysis of paired sample T-tests.

Table 7. Homogeneity test results

		Levene Statistic	df1	df2	Sig.
Student Learning Outcomes	Based on Mean	1.376	1	68	.245
	Based on Median	1.276	1	68	.263
	Based on the Median and with adjusted df	1.276	1	60.330	.263
	Based on trimmed mean	1.392	1	68	.242

based on the homogeneity test of the pre-test and post-test scores, a significance of 0.245 was obtained. From these results it can be concluded that the significance value is 0.245 > α (0.05), then the data is homogeneous. This significance value indicates that H0 is accepted so that the pre-test and post-test data are homogeneous (same). The results of the T-test from the research data analyst are as follows:

Table 8. Paired Sample T-test Result

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	preEks - postEks	-40.18971	5.76979	.97527	-42.17170	-38.20772	-41.209	34	.000
Pair 2	preKon - postKon	-30.09429	9.44471	1.59645	-33.33866	-26.84991	-18.851	34	.000

From the results of the T Paired Sample Test, the 2-tailed significance value in the T Paired sample test is 0.000, where the value is less than 0.05, it can be concluded that there is a difference in the average learning outcomes for the pre-test experimental class with the post-experimental test. Thus, H0 is rejected and H1 is accepted.

4.3 The Effectiveness of Mind Mapping-Based Electronic Pocket Book Media

The effectiveness test in this study was carried out utilizing a normalized gain score or N-Gain score statistical test. Based on the learning outcomes of students using the N-Gain score aims to determine the effectiveness of using a method in one group pretest-posttest design research as well as research using experimental and control groups. The effectiveness of student learning outcomes is first tested using the normalized gain test. The N-gain test was carried out to determine the increase between the pretest and posttest values.

Table 9. The N-gain Test Results

Descriptives					
	Kelas			Statistic	Std. Error
NGain_Persen	Experimental	Mean		74.5404	1.97779
		95% Confidence Interval for Mean	Lower Bound	70.5211	
			Upper Bound	78.5598	
		5% Trimmed Mean		74.6854	
		Median		73.3400	
		Variance		136.908	
		Std. Deviation		11.70078	
		Minimum		45.45	
		Maximum		100.00	
		Range		54.55	
		Interquartile Range		11.58	
		Skewness		-.071	.398
		Kurtosis		1.061	.778
	Control	Mean		49.7657	1.68521
		95% Confidence Interval for Mean	Lower Bound	46.3410	
			Upper Bound	53.1905	
		5% Trimmed Mean		49.4513	
		Median		49.9932	
		Variance		99.397	
		Std. Deviation		9.96981	
		Minimum		35.29	
		Maximum		72.00	
		Range		36.71	
		Interquartile Range		16.52	
		Skewness		.280	35.29
		Kurtosis		-.657	72.00

From the results of the calculation of the N-Gain Score Test, it shows that the average value of the results of the calculation of the N-Gain Score Test for the experimental class (with the media of an electronic pocketbook based on mind mapping on spatial material) is 74.54 or 74.54% rounded up 75% included in a quite effective category. With an N-Gain Score between 56 - 75%.

Then the average N-Gain Score for the control class (without electronic pocketbook media based on mind mapping on spatial materials) is 49.77 or 49.77% rounded off 50% is included in the less effective category. With an N-Gain Score between 40% - 55%.

Meanwhile, the T-Test (Independent Simple T-Test) as a hypothesis test (Test of Average) was carried out to determine the average difference in learning outcomes between the experimental class and the control class.

Table 10. T-Test Result

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Student Learning outcomes	Equal variances assumed	1.376	.245	7.285	68	.000	14.57171	2.00017	10.58043	18.56300
	Equal variances not assumed			7.285	63.602	.000	14.57171	2. 00017	10.57543	18.56800

The results of the t-test, namely the pre-test values for the Experimental Class and the post-test for the Experimental Class, obtained a significance of 0.000. From these results it can be concluded that the significance value is 0.000 <α (0.05), so it can be concluded that H1 is accepted and H0 is rejected, meaning that there is a significant difference in the learning outcomes of fifth-grade students before and after using mind mapping based electronic pocketbook media geometry

4. Conclusions

The development of an electronic pocketbook media based on mind mapping on mathematical spatial constructs is carried out through several stages. The development stages of the spatial electronic pocketbook media in this study include the stages of planning, process, evaluation, product validation, product revision, and product usage trials. The feasibility of electronic pocketbook media based on mind mapping material on mathematics is proven feasible and can improve student learning outcomes in fifth-grade elementary schools. The effectiveness of mind mapping-based electronic pocketbook media on mathematical geometrical materials based on the results of the N-gain score test calculations shows that the average value of the N-gain score for the experimental class is 75%. By looking at the table of the N-gain score test results between 56 - 75, it is stated that the use of electronic pocketbook media based on mind mapping on math building materials has proven to be quite effective in improving the mathematics learning outcomes of fifth-grade elementary school students.

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Conflict of Interest

The authors declare no conflicts of interest.

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