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Development of Bilingual Mathematics Digital Pocket Book to Improve Student's Ability in Understanding Plane Topic

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A B S T R A C T

The purpose of this study is to develop a valid, practical, and effective bilingual pocketbook to enhance students' ability to understand the field topic. Research carried out at the school of Islam's integrated al-ulum field. This research subject is a class vii-a. The study is a research and development (r&d) study using the addie model. The data-gathering technique USES the angkette sheet for assessment materials, resource experts, learning and student responses practitioners. Research shows that the digital library of bilingual materials materials gained an average percentage of 93.18% with a "totally valid" criteria based on assessment of materials and materials experts gained an average percentage of 94.5% with the "very practical" criteria as assessments. Teaching practitioners, and an average percentage came at 86.72%. With the "highly effective" criteria based on student assessments. The bilingual analytical book of aircraft topics developed in this study is also judged to be "effective" when viewed by a post-test value that reaches 90% compared with pre-test scores of 56%. Thus, based on the assessment of materials experts, materials experts, practitioners of learning, and students, it might be said that the digital pocket book of bilingual materials in fields has been tested valid, practical and effective for use in learning. Studying.

INTRODUCTION

Under the 2003 national educational system law number 20, it stated that education is a conscious and planned effort to create an atmosphere of learning and learning so that learners actively develop their own potential for religious spirituality, self-control, personality, intelligence. , noble morals, and skills required of him, society, nation, and state (rasyidinetc, 2016:26). The aim of national education is to brighten the lives of nations. As governed by the 2003 article 3 section of the national educational system of the republic of Indonesia, that education serves to develop the ability and establish the character and civilization of the Indonesian people.

Learning is a teaching process that plays a crucial role in determining students' success. From the learning process there will be a mutual activity between teachers and students for a better purpose. In the learning process, teachers as those who are supposed to have the ability to transfer science to learners are expected to perform professionally according to their science discipline. According to the sugiharto (2020) education is one of the efforts to increase human intelligence capabilities, enabling it to improve the quality of life. One way that educators can accomplish such goals can be done is by developing the material.

But in reality there are still many educators who depend on conventional teaching. Conventional teaching is an effective one that can be used directly without planning, preparation, and self-drafting effort. Mistakes in the selection of teaching results in students' understanding of less than optimal learning so that the obtained results do not meet the determined KKM (zuri, etc., 2016). It was in line with prastowo (2015) that the quality of low learning when educators were only riveted on conventional teaching without creativity for developing innovative learning.

Based on observations made by researchers at the 7a integrated field of Islam al-a class found in an interview between researchers and a math teacher, one of the factors affecting students' learning low was the lack of learning. Interest students in learning using printing materials that are too thick, monotonous and uninteresting and imconcise. So that students do not have the initiative to open books outside of class, the monotonous learning process and still many students are passive in math. After the interview, researchers also collected data through a need analysis of a charging charge addressed to the subject teacher and some students selected by the teacher. Based on interviews, and based on the results of the teacher and student needs analysis, 94% of angkets indicate that teachers need additional backups and 93% of students' angkets indicate that students need additional teaching materials. Thus researchers will develop a lesson in a digital pocket book in which the study material of this digital pocketbook is used as an additional one to help improve student learning rather than as a substitute for the parent book.

Based on the above description, under the same assumption, researchers are interested in doing research under the title "bilingual mathematical digital development book to enhance the student's ability to understand field topics."

LITERATURE REVIEW

Research and Development

Research and development (r&d) is the research method used to produce specific products and test their effectiveness. In education, research and development or research and development (r&d), is the research method used to develop and validate products used in education and learning.

According to (sugiyono, 2007) r&d research is a type of research that serves to produce something new and continues to test it. According to (mulyana, 2020) r&d research is a type of study that makes or develops new products using specific steps and according to (hanafi, 2017) r&d research is a method of research that produces an item and is thus tested in effectiveness.

The addie model (design, design, design, expansion, and design) was a research and development model introduced by reiser and mollenda in 1990 (halomoansiregar et al., 2021). An addie model is one of the most common models used in instructional design as a guide to effective design. It is an approach that helps learning designers, content developers of any kind, or even teachers to create efficient and effective teaching designs by applying addie model processes to any learning products.

Teaching Materials

It is a resource that plays an important role in supporting the learning process (ahmad&lestari, 2010). Zuria et al. (2016) revealed that teachers needed to be able to develop innovative and creative teaching materials according to curriculum, students' needs development, and information technology development.

Saintifik Approach

Curriculum 2013 learning is carried out with scientific approach (scientific approach). The saintifical approach comes from both approaches and perspectives. Approach (approach) has the sense of ideas or ideas being used to approach goals; And scientific means something that can be publicly repeated by the perpetrator, on a scale of space and time (by anyone, anywhere, and anytime). The scientific approach is an approach to building religious, social, knowledge and skill in students. A saintific approach can provide understanding to students in getting to know information and understanding various materials using a saintific approach.

Pocket Book

A pocketbook is a booklet that is easy to carry and fit into the pocket (the new English dictionary, 2012). According to hizair (2013:108) states that a pocket book is a small print medium that can be stored in a garment pocket and can be taken practically anywhere. Whereas according to the French (2013:1) tongues are short or limited, simple formats, and single-minded. Based on statements made by some of the experts, the conclusion from a pocket or a notebook isa small volume with a simple, interesting, brief presentation of material and can be used in communicating the learning or student process. Reader.

Digital Pocket Book

A digital pocket book of electronic books accessible by cellular phone with PDF (portable documentaries). Digital pocket books or digital pocket books have some advantage because they are softcopy, are not easily broken, do not need a large storage space, can be stored on lapbooks, PCS, mobile phones suitable for long study, cost production/printing, eco-friendly because using paper is reduced so that it can support go green in this globalization, the content in the material is designed in text, picture, sound, video or otherwise.

METHODOLOGY

Location and Time Research

This research was conducted at SMP ISLAM AL ULUM TERPADU MEDAN Jl. Tuasan No.35, SidorejoHilir, Kec. Medan Tembung, Medan City, North Sumatra 20222. The time of the study was carried out from April to May.

Type of Research

Type of research is Research and Development (R&D) .

Subject of Research

The subjects in this study were teaching materials expert lecturers, materials expert lecturers, mathematics subject teachers and students of SMP Islam Al UlumTerpadu Medan class VII-A.

Research Design

The study refers to r&d models with addie models of the five stages of analysis (design), development (development), implementation (application) and evaluation because of more rational research and development models. And more complete than any other model corresponds with product development steps. Research design outline the material selection, the needs analysis, curriculum analysis, the initial design, the development of the digital bilingual pocket book, the validation of bilingual math digital pocketbook, the testing of bilingual math digital pocketbook, and the final evaluation or revision of the digital bilingual pocket book. Pocketbook.

Data Collection Technique

Data collection techniques on the study include interviews, observations, questionnaires, and test methods (pretest&posttest) and documentation. The interview in this study was conducted to obtain information from a math teacher on the issues and USES of the material in secondary school subjects. Researchers gave assessments of the materials to validate their worthiness by materials experts, materials experts, junior math teachers, and students. This angket will be used to know the validity, effectiveness, effectiveness and student response to the teaching material. The test was used to assess the effectiveness of the developed bilingual math digital pocketbook. And the documentation that researchers are using are photos, pictures, and data on research conducted at the islamic junior high school all-terrain al ulum.

Data Analysis

Analysis of observation and interview results using descriptive analysis. **Walktrough analysis**using the formula set by Aiken (Retnawati, 2016), that is:

$$V = \frac{\sum s}{n(c-1)} = \frac{\sum(r - l_o)}{n(c-1)}$$

where :

V =index of rater/validator agreement regarding the validation of statement items

s =the score assigned by each trader/validator minus the lowest score in the category used

r =Rader/validator set score

l_o =lowest score in the used category

n =many radars/validators

c =many categories to choose from

From the result of the V index calculation, an item can be categorized based on its index. The index categories are listed in table 1.

Table 1. Category Item Index

Interval	**Category Validation**
0.0-0.40	Not enough
0.41-0.80	Currently
0.81-1.0	Very

Source: (Retnawati, 2016)

The analysis of comments and suggestions given by experts in the comments/suggestions section was analyzed descriptively.

Questionnaire analysis using formula

$$VR = \frac{\sum_{i=1}^{n} RA_i}{n}$$

(Alfajri et al., 2019)

where :

VR =average of practicality

RA_i =the average aspect of the i-th question

n =many aspects

Furthermore, the results obtained are categorized into practicality categories which are presented in the table 2.

Table 2. Practically Category

Score Interval	Practically Category
$1 \leq VR \leq 2$	Not Practical
$2 \leq VR \leq 3$	Less Practical
$3 \leq VR \leq 4$	Practical
$4 \leq VR \leq 5$	Very Practical

Khabibah in Aziza (2013) (in Alfajri et al., 2019)

Test Analysisis based on an assessment of student's answers to the development test. This analysis is used to see the potential effect given by the questions on students' higher-order thinking skills. The potential effect of the question is seen from the average score student in solving HOTS questions developed by researcher. Then, the average score is classified into several categories of higher order thinking skills. According to the International Center for Assessment of Higher Order Thinking (in Wulandari et al., 2020) students' higher order thinking skills are categorized into five categories, as in table 3.4.

Table 3. Category of Students 'Higher Order Thinking Skills

Student scores	Rating Category
81-100	Very good
61-80	Good
41-60	Enough
21-40	Not enough
0-20	Very less

Source : (Wulandari et al., 2020)

Item Validity Anlysiscalculated using the correlation formula, namely

$$r_{xy} = \frac{N\sum XY - (\sum X)(\sum Y)}{\sqrt{\{N\sum X^2 - (\sum X)^2\}\{N\sum Y^2 - (\sum Y)^2\}}}$$

Arikunto (2010) (in Riyani et al., 2017)

where:

r_{xy} =the correlation coefficient sought

N =the number of participants

X =the item score of the questions obtained by the students

Y =total score obtained by students

An item is said to be valid if $r_{hitung} > r_{tabel}$(Riyani et al., 2017). The r_{tabel} used in the two-way test with a significant level of 5% and $df = 30$, is 0.3494.

Question Reliability Analysisusing the Alfa Cronboach formula and criteria, namely

$$r_{11} = \left[\frac{n}{n-1}\right]\left[1 - \frac{\sum s_i^2}{s_t^2}\right]$$

(Lestari &Yudhanegara (2017) in Alfajri et al., 2019)
Description :
r_{11} =reliability coefficient
n =lots of questions
s_i^2 =the variance of the score of the i-th item
s_t^2 =total score variance

Table 4. Instrument Reliability Coeffecient Criteria

Reliability Coefficient	**Reliability Level**
$0{,}90 \leq r_{11} \leq 1{,}0$	Very high
$0{,}70 \leq r_{11} < 0{,}90$	High
$0{,}40 \leq r_{11} < 0{,}70$	Currently
$0{,}20 \leq r_{11} < 0{,}40$	Low
$r_{11} < 0{,}20$	Very low

Source : Lestari&Yudhanegara (2017) in Alfajri et al., 2019

Discrimination Powerusing formula and criteria, namely$DP = \frac{\bar{x}_A - \bar{x}_b}{X_{maks}}$
(Salmina & Adyansyah, 2017)
where:
DP = Discrimination Power
$\bar{x}_A$ =the average score of high-ability students
$\bar{x}_B$ =the average score of low-ability students
X_{maks} =maximum score set

Table 5. Discrimination Power Criteria

Discrimination Power	**Discrimination Power Level**
0,71-1,00	Very good
0,41-0,70	Good
0,21-0,40	Enough
0,00-0,20	Not Good
Negative	Very Not Good

Source: (Salmina & Adyansyah, 2017)

Difficulty Level Analysis using formula and criteria, namely

$$DL = \frac{\bar{x}}{X_{maks}}$$

where:
DL =difficulty level
$\bar{x}$ =the average score of students for one item
X_{maks} =the maximum score that has been set according to the level of difficulty

Table 6. Difficulty Level Criteria

DifficultyLevel	**Difficulty Level Criteria**
0,0-0,30 0,31-0,70 0,71-1,00	Hard Currently Easy

Source: (Salmina & Adyansyah, 2017)

RESULTS

The study produced 10 problems with hots, march and march class xi using 3d development models consisting of the stages of define, design, and texture. Results obtained from each stage of development are as follows:

1. Define

At the front-end analysis stage, researchers found out that the man 2 model of terrain had not yet followed the latest curriculum and was still using textbooks that were not dominated by hots issues.

At the stage of learner's analysis, the researcher gave a diagnostic test to 32 scion sophomores and got the results that the student was having trouble defining the problem.

In the phase of job analysis, researchers chose core competence (cc) 1-4 and basic competence (BC) 3.6 and 4.6 for high school xi/ma classes published by percibud (2018).

At the stage determining the purpose of learning produces 3 goals after completing the hots, that is

1. Able to implement rows and rows of arithmetic on problem solving.
2. Capable of analyzing problems related to rows and rows (c4)
3. Being able to judge, disprove, or support a thought about rows and rows by giving good reason (c5).

2. Design

At the construction of critical tests results in design for hots (consisting of grid problems, problem CARDS, and assessment guidelines) and practice design (itis made up of lattices and problems). The result of a set of questionnaires focuses on aspects of use, time, interest, and convenience.

At the stage of the selection of media, researchers select printing media

and electronic media.

At the selection stage of the format, researchers select the modified format presented by ariyana and kk. (2018) for a draft on hots, it is modified non-test instrument format that is presented by retnawati (2016) for practice assessment (2016), and a revised k-13 curriculum for RPGS.

` In the initial design results in RPGS that are validate by my thesis advisers, collate hots, and reframe practical issues that are ready to be developed at the stage of development.

3. Develop

This stage is the initial draft development stage through a process of validation, testing, and revision. This stage is divided into two stages, namely expert appraisal and developmental testing.

1. **Expert Appraisal**

There are three experts, two UNIMED Mathematics Education Lecturers and one MAN 2 Model Medan Mathematics Teacher, to validating draft HOTS questions and draft practically questionnaire.

The results are all the HOTS questions categorized very valid and for practically questionnaire categorized very valid in aspects of use and convenience but in aspects of time and interest categorized moderately valid.

2. **Development Testing**

At this stage, a product trial was conducted on the real subject, namely 32 students of class XI IPA 2. Students of class XI IPA 2 were asked to individually answer the HOTS questions on the material of sequences and series which had been validated by the validators and revised. Furthermore, students were asked to fill in their opinion on a practicality questionnaire that had been validated by the validators and revised as well. The practicality questionnaires were also filled out by several mathematics teachers at MAN 2 Model Medan who had previously read the HOTS questions.

1. Item Validity Test

From 10 HOTS questions that develop, there are 6 questions that categorized valid, 3 questions that categorized invalid, and 1 questions that can't categorized becuase all students get the same score so that the calculated r value obtained is indeterminate (∞).

2. Question Reliability Test

The reliability of HOTS questions for sequence and series topic obtained is 0,6312, including the category of moderate reliability.

3. Difficulty Level

The difficulty level of the 10 HOTS questions on sequence and series topic, there are: 1 questions in the difficult category, 3 questions in the medium category, and 6 questions in the easy category.

4. Discrimination Power

Variant power from 10 hots on the topic of rows and circuits, namely: 2 on good words, 6 on good ones enough, 1 on bad ones, and 1 on bad ones.

5. Practically Question

It's an impractical matter obtained from an angket filled with sophoma-grade students and the mathematics teacher of the man 2 field model. According to students, the practical results obtained were 3.9082 in the category. According to the teacher, results obtained by 4.2188 in the highly practical category. So the combined results of teacher and student practice at 4.0635 were highly practical.

6. Potential Effect

The potential impact of this study is seen from the use of new knowledge and skills by the known student from the student's answers. The student's answers are calculated to see the average score. The average scoring result of all students is 70,8594, which means the potential influence that hots might have on the range and bearing materials developed by researchers has a potential for good influence on a student's high-level thinking ability.

DISCUSSION

The study produced the final 10 column hots and series using the 3d model r&d (research and development). A step through which this study is to define, design and develop.

At the defining stage an identification and analysis of the product - related problems will be used. They divide into front-end analysis, learning analysis, assignment analysis, concept analysis, and the purpose of learning analysis. The data collecting process on the front-end analysis stage is done through an open interview for a math teacher and partition observation in xi science class 2, whereas the data-collecting process at the learner's analysis stage is done with diagnostic tests. Results obtained at the defined stage are the need for the development of hots in linear and sequential matter.

At the design stage, the initial design of the product was designed. The stage is divided into construction criteria testing, media elections, selection formats, and initial design. Results also obtained at the design stage are hots and adhesive design.

The last is the stage of development. It consists of the expert assessment stage and development testing stage. At the expert assessment stage, drafts of hots and drafts of angkets were validated by three validator persons. Validation of the draft on hots is that each item in hots scores an average of 0.8 centimeters. And it's categorized perfectly valid. The comments and Suggestions given by the three validator serve as guidelines in revising the hots draft. Furthermore, the results of the validation on the appraisal design are obtained validation value of 0.667. The comments and Suggestions given by the third validator to the ballpoint draft of practicality are also used as guidelines in revised the ballpoint scheme.

After that is the development testing phase. At this point the student who has passed the training stage answers the hots questions on the lines and rows that the validator has validated and revised by researchers. The results of that answer are used to know the validity of the problem, its religious ability, its diversity, its level of hardship, its practicality, and its potential impact. Of the 10

categories of material hots, 6 issues of valid categories, 3 of invalid valedicts, 1 question cannot be categorized because of uncertainty of r-count. 10 religious capabilities on hots falls into the medium category with a coefficient value of 0.6312. The different power from 10 different hots, which is 2 different ways of having different strengths, 6 different ways of having different strengths quite well, 1 for possessing.

Hots developed into a very practical category with an average value of practical excellence made up of science-2 students and a math teacher of 4.0634. That means that series and series hots developed are easy to use.

Test calculations show that the average high school student from the xi science class 2 has a well-valored 70,859 cognitive ability. Meaning that the average student can improve high levels of thinking ability well in dealing with hots. It shows from the analysis of the student's description of the student's answer at table 4.9 that the average student in the hots problem is able to generate high-level thinking skills at an analysis (c4) and evaluation (c5) level. The indicator of high-level thinking ability at the level of analysis (c4) is that students are able to study and describe information exactly, students are able to formulate problems, students are able to give the right approach. While a high level indicator of thinking ability at the evaluation level (c5) of a student is able to judge, deny, or support an idea and the student is able to give a solid reason for its assessment. This harmonizes with a level of effectiveness of development, which is the use of new knowledge and skills by students (application's use of new knowledge and skills). (guskey, 2000; Zulardi, 2002 in wahyudi, 2016).

CONCLUSIONS AND RECOMMENDATIONS

Based on the results and discussions presented in chapter iii, they could be summed up as follows:

1. The digital pocketbook of the bilingual airplane topics developed was declared "valid" by the validator with a 93.18% percentage
2. The bilingual mathematical pocketbook on the plane topic developed was stated as "practical" by the study practitioner ata percentage of 94.5%

The digital pocket book of bilingual mathematics at developed flat building materials is rendered "effective" based on student assessments ata percentage of 86.72%. The bilingual analytical book of aircraft topics developed in this study is also judged to be "effective" when viewed by a post-test value that reaches 90% compared with pre-test scores of 56%. Indicating an increase in learning results after using the product development of the bilingual mathematical digital pocketbook.

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