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Development of Learning Devices through Problem Based Learning Model Based on the Context of Aceh Cultural to Improve Mathematical Communication Skills and Social Skills of SMPN 1 Muara Batu Students

Mahrani Aufa Sahat Saragih Ani Minarni
Department of Mathematics, Science Faculty, State University of Medan, Jl. Willem Iskandar
Pasar V Medan Estate, Kode Pos 20221, Indonesia

Abstract
The purposes of this study were:1) Developed problem-based on learning tools in the cultural context of Aceh (PBM-BKBA) who meet the criteria are valid, practical and effective; 2) Described the improvement of communication capabilities mathematics and social skills of students using the PBM-BKBAdeveloped; and 3) Described the process of student answers in solving mathematical communication skills.Research development of 4-D model was done in two stages: 1) the development of learning devices; and 2) testing devices. The subjects in this study were students of class VIII SMPN 1 Muara Batu, while the object is the PBM-BKBA developed, mathematical communication skills, and social skills of students. The results were obtained: 1) The PBM-BKBA that developed have valid criteria, practical and effective; 2) There is an increased ability of mathematical communication and social skills of students using the PBM-BKBA developed; 3) the student answers on trial II trial better than I.
Keywords: PBM-BKBA devices development, 4-D models, mathematical communication, social skills, process the answer.

1. Introduction

Mathematics is one of the subjects taught at every level of education, starting from early childhood education to the level of Higher Education. Mathematics is also the science that underlies the development of science and technology, so that mathematics is seen as a structured and integrated science, the study of patterns and relationships, and the science of thinking to understand the world around. Cornelius (Abdurrahman, 2012: 204) suggests five reasons for studying math because math is (1) a means to think clearly and logically, (2) the means to solve the problems of everyday life, (3) the means to know the relationship patterns and generalizations experience, (4) the means to develop creativity, and (5) a means to increase awareness of cultural development.
But in fact the quality of mathematics education in Indonesia is still low. It is supported by the TIMSS results (The Third International Mathematics Science Study) started in 1999, 2003, 2007, and 2011. Indonesia in 1999 was rated 34thout of 38 countries, 2003 was rated 35thout of 46 countries, and in 2007 was rated 36thout of 49 countries (Kemdikbud: 2016). Meanwhile, in 2011, Indonesia was to rank 38 of the 42 countries with a value of 386 (IEA, 2012: 56). Conditions were not much different can also be seen from the results of studies conducted PISA (Programmed for International Student Assessment), where the results of PISA in 2012 Indonesia was ranked 64thout of 65 participating countries with an average score of 375, while the average of international score is 500 (OECD, 2014: 5).

The low quality of mathematics education as mentioned above should be fixed. Therefore, mathematics in schools should be able to strive for students to develop the ability to think, reason, communicate ideas and can develop creative and problem-solving activities. This is in accordance with the disclosed NCTM (2000: 29), the standard capabilities that must be achieved in mathematics includeproblem solving, reasoning and proof, communication, connections and representation

It is referring to one of the standard process, namely mathematical communication skills is an ability that must be owned by the students. Baroody (Saragih, 2007: 5) says there are at least two important reasons why mathematical communication needs to be cultivated among students. (1), mathematics as language, (2) mathematics learning as a social activity. Thus, communication mathematically well as social activities as well as a means of thinking the ability to obtain recommendation by experts in mathematics education in order to continue to be cultivated and improved among students.

In fact, from the preliminary findings of researchers by asking questions to measure the ability of mathematical communications on the matter prism and pyramid to students of SMPN 1 Muara Batu found that mathematical communication skills of students is still low, with only 4 students from 45 students or 8.89% are able to make mathematical model with full completion of the steps and the correct answers with either category, 15 students from 45 students or 33.33% were able to create a mathematical model with the completion of the steps was not complete and correct answer with enough categories, and 26 students from 45 students or 57.78 % of students cannot create a mathematical model altogether. This was confirmed by Yusra & Saragih (2016: 2), "The

reality found in the field, learning of mathematics for this still little attention to thedevelopment of mathematical communicationskills, so that mastery of these competencies forstudents still low". Then Yusra & Saragih (2016: 2) add statement "From the students' answers, it can be seen that students just answer the question directly, unfocused and difficult to understand. When they are asked to explain the student can not express how to get the answers, students only see the existing numbers and directly add up. From the students' answers can be concluded that young people have less mathematical communication skills in communicating the answer".

As well as mathematical communication skills, social skills of students is also an important thing to note. According to Dowd and Tierney (Yanti, 2006: 3), children need to be taught social skills as this is an important factor that can help children successfully achieving goals and success in life.This opinion is similar to that proposed Hair, Jager & Garrett (Bremer & John, 2004: 1), "observe that adolescents who have strong social skills, particularly in the areas of conflict resolution, emotional intimacy, and the use of pro-social behaviors, are more likely to be accepted by peers, develop friendships, maintain stronger relationships with parents and peers, be viewed as effective problem solvers, cultivate greater interest in school, and perform better academically".

The lack of aspects of social skills can bring a significant impact on one's life journey. The lack of social skills causing association attitude characterized by a tendency to be individualist (contra collaborative), did not appreciate different opinions, intolerant, arrogant and so forth. It is appropriate that stated Mujis & Reynolds (Kadir, 2008: 344) states that "the lack of social skills of the students will have an impact on the low academic achievement of these students, tend to loneliness and appeared self-esteem is low, and there will likely be drop out of school.

In order to foster mathematical communication skills and social skills of students, we need a device that supports learning. The purpose of learning is the development of devices to produce a learning device capable of solving problems in the classroom, because essentially there is no single source of learning that can meet all kinds of purposes learning process.

In response to the problems that arise in mathematics as described above, is primarily concerned with mathematical communication skills and social skills of students, it is necessary for teachers or researchers chose to study that could change the paradigm. Problem Based Learning model (PBM) is one solution, because according to Arends (2008b: 41), problem based learning model is a model of learning by learning approach the students on the issue of authentic and meaningful to students who serve as the foundation for investment and research students, so students can construct their own knowledge, to develop higher skills and inquiry, independent students, and increase the confidence of students. This was confirmed by the results of research Nufus (Saragih & Habeahan, 2014:124), "showed that there is an increase in communication and problem solving skills through the application of mathematical problem-based learning in the classroom VII SMP".

To develop learning tools that can develop mathematical skills, especially communication skills math and social skills through PBM, will be more effective if in the development of learning tools that integrate elements of local culture. Bishop (Tandililing, 2013:194) says that mathematics is a form of culture. Mathematics as a cultural form, actually has been integrated in all aspects of people's lives wherever they may be. Thus the mathematics of a person affected by their cultural background, because all they do is based on what they see and feel.

Culture-Based Learning (ethnos-mathematics) is one alternative that can bridge the culture of mathematics. Pannen (Sutama, et al., 2013:5) says that a culture based learning strategies learning environment creation and design learning experiences that integrate culture as part of the learning process. Culture is integrated which kinds of cultural context on the ground in Aceh.

The integration of the cultural context of Aceh into the device mathematics learning can provide opportunities for teachers to improve the communication skills of mathematics and social skills of students as well as introducing multivarious cultural context Acehnese close to a child's environment, so that the culture maintained continuity and opportunities for development remain open in the school environment. Interesting develop the problem-based learning in the cultural context of Aceh (PBM-BKBA) is to help students become aware of how students can think mathematically according to their culture and traditions. Therefore, development of the PBM-BKBA is needed to enrich the students' knowledge of mathematics, mathematical improve communication skills and social skills of students, enabling students to face global challenges and also students closer to the cultural environment.

In accordance with the problems that have been described, the purposes of this research are: 1) Develop problem-based on learning tools in the cultural context of Aceh (PBM-BKBA) who meet the criteria are valid, practical and effective; 2) Describe the improvement of communication capabilities mathematics and social skills of students using the PBM-BKBA developed; and 3) Describe the process of student answers in solving mathematical communication skills.

2. Literature

2.1 Ability of Mathematical Communications

In general, the communication can be interpreted as an event of mutual convey information from the communicator to the communicant in a community and cultural context. According to Saragih & Rahmiana (Yusra & Saragih, 2016:2), "Communication in general can be interpreted as an event to convey the message or the information to each other within a community". Associated with the communication of mathematics, The Intended Learning Outcomes (Husna, et al., 2013:85), revealed that the communication of mathematics is an essential skill in mathematics that is the ability to express mathematical ideas coherently to friends, teachers and others through the spoken language and writing.

Based on the above it can be concluded that the communication skills of mathematics is the ability to connect messages by reading, listening, asking questions, and then communicate the location of the problem and present them in solving problems that occur in a classroom environment, where there is a transfer messages that contain material math studied.

The indicator communication skills mathematics in this study refers to the NCTM 2000 which is tailored to the needs of researchers, which is limited to written communications, which are grouped into three, namely (1) to explain the idea or situation of an image that is described by his own words in writing ; (2) to declare a situation with an image; and (3) to states the situation into a mathematical model.

2.2 Social Skills

Social skills can generally be understood as behaviors that were reinforced in accordance with the age of the individual and social situation resulting acceptance and positive assessment of others and does not result in penalties. According Libet & Lewinshon (Cartledge & Milburn, 1986:7) states that: Defined social skill as 'the complex ability both to emit behaviors that are positively or negatively reinforced, and not to emit behaviors that are punished or extinguished by other.

Social skills are indispensable when students enter a peer group because it can bring children to dare to express themselves, express any feelings or problems and at the same time find solutions that are adaptive, so they do not look for an escape to the other things that could potentially harm themselves and other people. The indicators of social skills that are used in this research refers to the opinion of Horner (Bremer & John, 2004: 3), namely: (1) Peer relational skills; (2) Self-Management Skills; (3) Academic Skills; (4) Compliance Skills; and (5) Assertion Skills.

2.3 Problem Based Learning Model Based On Cultural Context of Aceh (PBM-BKBA)

PBM-BKBA Model based on a theory of learning that adopts constructivism. PBM-BKBA Model is a modification or refinement PBM models by taking into account the characteristics of mathematics, mathematics learning objectives, and utilization aspects of Acehnese culture that strongly affect the activity and mental development. The modifications made to the PBM models in this study is the first phase "orientation of students on the issue" where necessary affirmation that the various problems which are designed by teachers to be sourced from the facts and cultural environment in which the student resides. That is, the issue raised is not just related to real life and the student experience, but it really comes from the fact, and cultural environment of students, which in this study is devoted to the cultural context of Aceh.

According Sinaga (2007:62) in philosophy, mathematics is the result of the construction of human thought. Therefore, the mathematical result of the reflection of human thinking and problem solving, then mathematics can be said to be the result of human ingenuity and effort. Bishop (Ernest, 1991:205) asserts that: **"**Mathematics…is therefore conceived of as a cultural product, which has developed as a result of various activities…Counting…Locating…Measuring…Designing…Playing…Explaining…Mathematics as cultural knowledge, derives from humans engaging in these six universal activities in a sustained and conscious manner".

It is asserted that mathematics is a cultural product developed as a result of various human activities. More Davis & Hersh (Ernest, 1991:263) reveals that: "Since mathematics is linked with all human knowledge, it is culture-bound and imbued with the values of its makers and their cultural contexts. Consequently, it pervades social and cultural life. This means that a basis for the cultural location of mathematics is needed".

Culture largely determines how the student perspective in addressing it, including in understanding a matter of mathematics. This means that when the material is so far from their cultural schemes such material would be difficult to understand. PBM-BKBA model is one alternative that can bridge the culture of mathematics.

Based on the above, the model of PBM-BKBA is a learning model that refers to the five (5) key steps in problem-based learning, namely: (1) the orientation of students on the problem, where the problem given that contextual problems relating to diverse contexts Acehnese culture; (2) organize the students to learn; (3) guide the investigation of individual and group; (4) develop and present work; and (5) analyze and evaluate the problem-solving process.

2.4 Resolution Process Answer Students in Problems Solving Mathematical Communication Ability

Working students answer process is very important in learning. The process systematic answer is the students answers on tests of mathematical communication skills. Process answer or the problem solving process students are not covered in one way only. In order to process more answers varied, structured and systematic then the teacher should be able to create learning to enable students to answer the question more systematically. Hopefully, through the development of the PBM-BKBA settlement process students' answers are more varied, structured and systematic.

3. Research Methodology

This research was the development by using 4-D model of development Thiagarajan, Semmel, and Semmel (1974) ich consists of four stages, namely stage define, design, develop and disseminate.

3.1 Subject and Object

Subjects in this study were students of class VIII SMP Negeri 1 Muara Batu academic year 2015/2016, where as the object of this research is the PBM-BKBA on the material prism and pyramid, mathematical communication skills and social skills of students. The first trial was conducted in classes VIII /2 and a second test is done in class VIII /1.

3.2 Learning Tool Procedure Development

Learning tools developed are: 1) The implementation plan Learning (RPP), Student Book (BS), Student Activity Sheet (LAS), Learning Ability Test (TKB), in particular mathematical communication skills, and social skills of the student questionnaire. Development of learning devices to use the 4-D model. However, in this study do not disseminate stage, so it is not explained in depth. Model development in this study are summarized schematically in Figure 1 below.

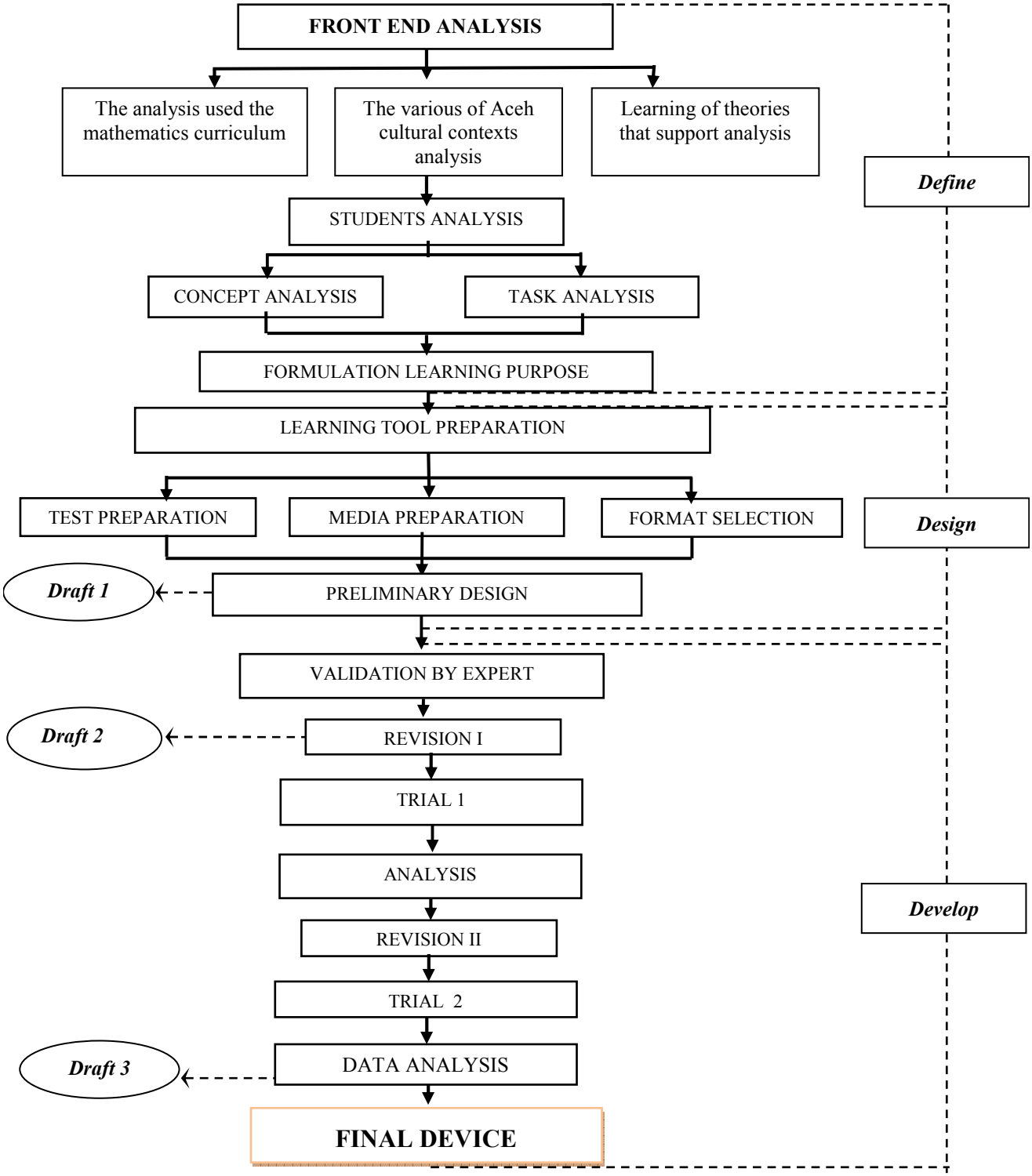


Figure 1 : Chart Development of Learning Devices 4-D Model (*Modified* Yuliani & Saragih, 2015:119)

3.3 Instruments and Data Analysis Technique

Instruments and tools for collecting data in this study are the use test, questionnaire and observation sheet. For more details can be seen in Table 1 below.

Table 1. Instruments and Data Analysis Technique

Rated Aspect	Instruments	The Observed Data	Respondents
PBM-BKBA Validity Device	Validation Sheet	RPP validity, BS, LAS, Mathematical Ability Test Communication and Social Skills Questionnaire	Expert/Specialist
Practicality PBM-BKBA Device	Validation Sheet	RPP Practicality, BS, LAS, Mathematical Ability Test Communication and Social Skills Questionnaire	Expert/Specialist
	Observation Sheet	Improvement of PBM-BKBA Device	Observer
Effectiveness of PBM-BKBA Device	Test	Mathematical Communication Ability Test	Subject Test
	Observation Sheet	Students Activities	Observer
	Questionnaire	Response of Students	Subject Test

3.3.1 PBM-BKBA Validity Analysis Tools

PBM-BKBA device developed in validation by five validator. The criteria for the validity of the PBM-BKBA as follows:

Table 2. Level of Criteria Validity

No	*Va* or value of average total	Validity of Criteria
1	$1 \leq Va < 2$	Invalid
2	$2 \leq Va < 3$	Less
3	$3 \leq Va < 4$	Enough
4	$4 \leq Va < 5$	Valid
5	Va	Best Valid

Source:(Sinaga, 2007:161)

Annotation:

Va is the level validity of value determination of PBM-BKBA device.

Criteria states PBM-BKBA device has a good degree of validity, if the validity of the minimum level reached is valid level ($4 \leq Va < 5$). If the level of achievement of the validity under valid, it is necessary to revise based on input (correction) experts. Furthermore, the re-validation activities.

PBM-BKBA devices that have been revised based on input from experts outside the classroom later tested samples in order to get a decent learning device in order. Then, the test results are analyzed for validity and reliability. The formula used to calculate the validity is the product moment correlation (Arikunto, 2012: 87), namely:

$$r_{xy} = \frac{N\sum XY - (\sum X)(\sum Y)}{\sqrt{\{N\sum X^2 - (\sum X)^2\}\{N\sum Y^2 - (\sum Y)^2\}}} \quad (1)$$

Annotation:

X : score items

Y : total score

r_{xy} : the correlation coefficient between the item score and total score

N : the number of students who take the test (sample)

Then, to determine the coefficient of reliability of a test used in narrative form alpha formula (Arikunto, 2012: 122) as follows:

$$r_{11} = \left(\frac{n}{(n-1)}\right)\left(1 - \frac{\sum \sigma_i^2}{\sigma_I^2}\right) \quad (2)$$

Annotation:

r_{11} : reliability coefficient test

n :the number of test items

$\sum \sigma_i^2$: the amount of variance test scores of each item

σ_I^2 : the total of variance

3.3.2 Practicality of PBM-BKBA Analysis Tool

The first of Analysis the practicality PBM-BKBA is to use the validation sheet, where all validators/experts stated that the PBM-BKBA device can be used with "minor revision" or "no revision". As for seeing the enforce ability of the device used PBM-BKBA observation sheet improvement learning device. Criteria improvement learning device is as follows:

- Very Low, If $0 \leq \bar{P} < 1$
- Low, If $1 \leq \bar{P} < 2$

- Enough, If $2 \leq \bar{P} < 3$
- High, If $3 \leq \bar{P} < 4$
- Very High, If $4 \leq \bar{P} \leq 5$

Annotation:

$\bar{P}$ is the average score

PBM-BKBA device is said to be practical or easy to implement if the enforce ability of the PBM-BKBA are in the category of high minimal. As for the reliability of the observation sheet doing, learning device was tested with the following formula, Borich (Herman, 2012:5):

$$\text{Porcentase of agreement} = \left[1 - \frac{A-B}{A+B}\right] . \ 100\% \quad (3)$$

Annotation:

A : Frequency aspects of behavior observed by observers give high frequency

B : Frequency aspects of behavior observed by an observer who provides low frequency

Observation sheet improvement learning device is said to be good if it has a reliability coefficient of 0.75 or 75%, Borich (Herman, 2012:5).

3.3.3 The Effectiveness of PBM-BKBA Analysis Tool

A. Data Analysis of Mathematical Communication Ability Test

The first of effectiveness PBM-BKBA based on the achievement of students in the classical mastery learning. The criteria that states students have been able to communicate mathematically if there are 85% of students who took the tests of mathematical ability communication with at least a grade of 75 (Trianto, 2009: 241). The percentage can be calculated by the formula:

$$PKK = \frac{The\ number\ of\ students\ who\ pass\ the\ study}{Total\ Whole\ Students} \times 100\% \quad (4)$$

Annotation:

PKK : Percentage of Classical Completness

B. Data Analysis of Students Activity

The effectiveness of the PBM-BKBA device are both based on the activities of students meet the tolerance criteria predetermined time. Calculation formula is as follows:

$$Percentage\ of\ Students\ Activities = \frac{The\ frequency\ of\ every\ aspect\ of\ observation}{The\ total\ of\ times\ all\ aspect\ of\ observation} \times 100\% \quad (5)$$

Criteria for the effectiveness of student activity based on the achievement of the ideal time applied are as follows.

Table 3. Percentage of Time Ideal for Students Activities

Aspect Category	Ideal Time	Tolerance Interval PWI	Criteria Ideal
1. Listening / paying attention to the teacher's explanations	25% of WT	$20\% \leq PWI \leq 30\%$	Three of 1, 2, 3, 4, 5 achieved and 3, 4 have to achieved
2. Reading Books Student and LAS	15% of WT	$10\% \leq PWI \leq 20\%$	
3. Taking note of the teacher's explanations, notes from books or from friends, solve problems in the LAS, summarizes the work group	30% of WT	$25\% \leq PWI \leq 35\%$	
4. Discussing / ask between students and peers and between students and teachers, concluding a procedure or concept	30% of WT	$25\% \leq PWI \leq 35\%$	
5. Doing something that is irrelevant to learning	0% of WT	$0\% \leq PWI \leq 5\%$	

Source: Modified from Sinaga (2007:169)

Annotation:

PWI is the ideal percentage of time

WT is the time available at each meeting

C. Student Response Data Analysis

The effectiveness of the third PBM-BKBA device is based on student responses. Student questionnaire responses were analyzed by using the formula below, Borich (Herman, 2012:5):

$$PRS = \frac{\sum A}{\sum B} \times 100\% \quad (6)$$

Annotation:

PRS : The percentage of students who leave a lot of positive responses to each category in question.

$\sum A$: The proportion of students who choose

$\sum B$: Number of students (respondents)

The criteria are set to say that the students responded positively to the learning media that was developed when

the number of students who gave a positive response is greater than or equal to 80% of many subjects in the study for each field tests (Sinaga, 2007: 171).

D. Questionnaire Data Analysis of Social Skills

Achievement of the instrument used in the student social skills are taken based on the *Likert* scale. As for determining the range of students' social skills assessment used the criteria refer to the opinion of Sarwiji Suwandi (Prastini & Retnowati, 2014: 169) as below:

Table 4. Social Skills Mastery Level

No	Convertion Value		Catagory
	Value	Letter	
1	76-100	A	Highly Skilled
2	51-75	B	Skilled
3	26-50	C	Enough Skilled
4	0-25	D	Less Skilled

Source: Sarwiji Suwandi (Prastini & Retnowati, 2014: 169)

4. Result

The results of the development of the KBM-BK is presented as follows:

4.1 Phase I. Define

A. Front end analysis

Based on the observation of the learning media in Junior high school, SMPN I Muara Batu was found some weaknesses in the learning media used by teachers. Reviewing from the RPP, teachers have not developed of lesson plan that occupy the criteria that have a high validity. Next to the student book (BS), which is used mostly still very general and does not start with a problem but it starts with the concept so that students construct their own knowledge and do not find yourself concept. Then the student book (BS) that is used does not contain a map of concepts, less presents a problem is not routine, does not contain questions contextually related to the diverse cultures that exist in the environment of students as well as the presentation of the questions still lacking in supporting the development of communication skills of mathematics, whereas LAS untapped at the school. Similarly, the evaluation tool. Teachers designed the evaluation tools without regard to the ability of the indicators to be achieved.

B. Students Analysis

In general, the cognitive development of students of SMPN I Muara Batu enters the formal operational stage. It is marked on the age of the students of SMPN I Muara Batu is located in the age range 12-14 years, which if referred to the opinion of Piaget (Trianto, 2009: 30), then the cognitive development of students at that age is the formal operational stage.

C. Concept Analysis

Results of concept analysis obtained that the material prism and pyramid refers to the curriculum KTSP. The material taught prism and pyramid made up of three sub-topics, namely the surface area of the prism and pyramid, volume of prism and pyramid and changes in the volume of prism and pyramid.

D. Task Analysis

Tasks performed by the students in the learning contained in LAS is to find a concept or knowledge, applying concepts /knowledge found them to solve problems in everyday life. Further tasks performed by students in the study contained in the RPP and the Student Book is the same, which is carried out by students independently as an exercise at the end of the learning or used as homework (PR).

E. Formulation of Learning Objectives

Results obtained formulating learning objectives adjusted by the Competency Standards (SK) and the Basic Competency (KD), which refers to the curriculum KTSP.

4.2 Phase II. Design

A. Results of Preparation Test and Non-Test

The test was arranged was mathematical communication skills, while non-test was arranged was social skills quissionare. Tests of mathematical communication skills was structured description consisting of four (4) items, while for non-test are social skills questionnaire consists of 30 items that 15-point declaration statement positive and negative 15-point statement.

B. Results of Election Media

Teaching aids used are images embodiment prism and pyramid in the culture of Aceh, rulers, paperboard, scissors, cutter, glue/double tip, pens, pencils, erasers, and infocus, and cube props in which there are 6 units of pyramid.

C. Result of Election Form

The Result of election form in this research adapted to the KTSP curriculum. In according to the KTSP curriculum,

in Learning Implementation Plan (RPP) listed Standards competention, basic competention, learning indicator, learning objectives, learning materials, learning activities, assessment and learning resources, learning model, method, time allocation, test and answer key and scoring guidelines. The learning activities consist of initial activities, core activities and closing activities. Further to the Student Book Form (BS) refers to the rules of the National Education Standards Agency (National Standards) and form of LAS created in color so that students will be interested and motivated to learn.

D. Results of Preliminary Design

At this stage, produced the preliminary design of the learning media that is Learning Implementation Plan (RPP), Books Students (BS), and Sheet Activities Students (LAS) for 3 (three) time meetings, mathematical communication skills test, guidance scoring, answer key, and social attitudes questionnaire skill of students. All the results of the design phase are referred draft I.

4.3 Phase III. Develop

The results of define and design phase produce the preliminary design of a learning media called the draft I. After the PBM-BKBA designed in draft I, then validition tests by experts/specialists (expert review) and field tests conducted.

A. Validator and Validation Results of Learning Media

Before learning media tested on a trial class, first performed validation by 5 validators. The validation of the results can be found in the PBM-BKBA developed is "valid" and can be used with the "some revision". In addition, the research instrument tested on samples outside the classroom is a test of mathematical communication skills and social skills questionnaire also "can be used or valid". To test the reliability of mathematical communication skills of 0.643 (high category) and social skills questionnaire attitudes of 0.872 (very high category).

B. Result of Trial I

After learning tools developed have met the criteria of validity (second draft), then the next device in the form of draft II study was trialed in the study are SMPN I Muara Batu, here in after referred to as the first trial held in VIII-2.

Overall, the results of the analysis of trial data I is the PBM-BKBA developed yet meet all the criteria of an effective set, because they are indicators of the effectiveness of which has not been met and that the results of the posttest communication skills of mathematics at the trial I do not meet the criteria for the achievement of mastery in classical.

Table 5. The level of Completeness Classical Mathematical Communication Ability Trial I

Category	**Mathematical Communications Capabilities**	
	The Number of Students	**Percentage**
Complate	16	64%
In-complate	9	36%
Sum	25	100%

From Table 5. indicates that, mastery learning students in the classical test results communication capabilities mathematics that students who passed were 16 students from 25 students or (64%) and the number of students who did not complete was 9 students, or (36%) of 25 students take the test mathematical communication skills.

Based on the analysis of the trial I then need to revise some of the components of the learning device that was developed with the hope of PBM-BKBA device can improve communication skills of mathematics and social skills of students.

C. Result of Trial II

After the test I in the draft II, further improvements to produce a learning device that meets all the criteria set forth practical and effective. The results of revisions to the draft II to produce III which further draft will be tested in class VIII-1.

Overall, the results of data analysis II trial showed the PBM-BKBA developed has met all the criteria set forth practical and effective, namely: (1) adherence to the learning device for 3 (three) meetings have reached a very high category (device PBM- BKBA been able to say practical and can be applied) and the percentage of the overall reliability of the observation sheet exercise learning device has reached ≥75 (good category); (2) The posttest results of mathematical communication skills have met the criteria of completeness in the classical achievement; (3) students in learning activities have met the ideal time specified; and (4) students respond positively to the device components PBM-BKBA developed.

Table 6. Level of completeness Classical Mathematical Communication Ability Trial II

Catagories	Mathematical Communication Capabilities	
	The Number of Students	Percentage
Complete	23	92%
In-Complete	2	8%
Sum	25	100%

From Table 6 indicated that, mastery learning students in the classical test results communication skills math on trial II was complete student was 23 students from 25 students or (92%) and the number of students who did not complete was 2 students or (8%) of the 25 students who took the tests of mathematical communication skills. Based on trial results II can be concluded that the PBM-BKBA developed has met all the criteria set forth practical and effective.

5. Description of Students Mathematic Communication Upgrades Use PBM-BKBA developed Tools

Description of student mathematic communication use PBM-BKBA developed tools at trial I and II are shown in Table 7 below.

Table 7. Description of Mathematical Communication Ability Results

Explanation	Mathematical Communications Trial I Posttest	Mathematical Communications Trial II Posttest
The highest score	87.50	95.83
Lowest Rated	50.00	68.75
Average	74.25	80.33

Furthermore, Description of student mathematic communication use PBM-BKBA developed tools at trial I and IIfor each student mathematical communication indicator can be seen in Table 8 below.

Table 8. Average Communication Skills Math Students for Each Indicator

Indicators of Mathematical Communications	Average		
	Trial I	Trial II	Step Up
Explaining the idea or situation of an image that is described by his own words in writing	10.28	11.20	0.92
Declaring a situation with image	13.12	13.88	0.76
Declared the situation into a mathematical model	12.24	13.48	1.24

According to the table 7 and table 8 above it can be concluded that the use PBM-BKBA device developed impact on improving communication skills both in terms of the mathematical average of the test results communication skills as well as on each of the indicators mathematical communication skills.

6. Description of Improved Social Skills Students After Adoption of PBM-BKBA device developed

Description of Improved Social Skills Students After Adoption of PBM-BKBA device developedare shown in Table 9 below.

Table 9. Average Score Trials I and Trials II Social Skills Students

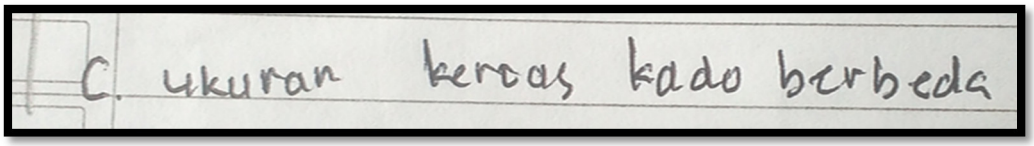
No	Social SkillsAspects	Average per Indicator		Set-up Average
		Uji Coba I	Uji Coba II	
1	*Peer Relational Skills*	**16.88**	**18.84**	**1.96**
2	*Self-Management Skills*	**18.40**	**19.72**	**1.32**
3	*Academic Skills*	**16.64**	**18.28**	**1.64**
4	*Compliance Skills*	**20.08**	**20.88**	**0.8**
5	*Assertion Skills*	**18.60**	**19.76**	**1.16**
Average Total All Indicators for Every Trial		**90.6**	**97.48**	
Total Average Improvement All indicators of Trial I to Trial II				**6.88**

According to the table 9 can be concluded that the social skills of students after the implementation of PBM-BKBA tools developed increased from the trial I to trial II.

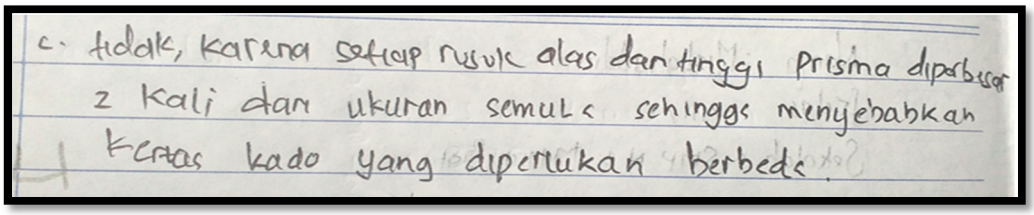
7. Description of Answer Student Process

Analysis of students answers to the settlement process in completing the posttest mathematical communication skills can be seen by the formulation of each item. This analysis is carried out to locate the weaknesses of students in the completion of the test answers to solve mathematical communication skills. Here is a translation of some of the students' answers in solving mathematical communication ability test.

A. Problems for Question No. 1c



(a) Trial I

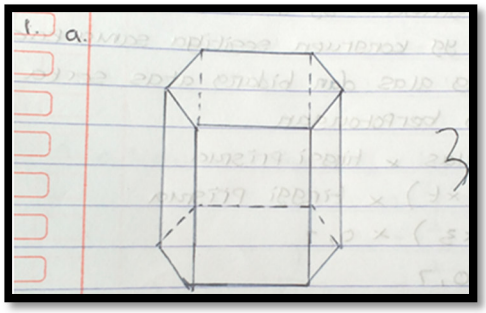


(b) Trial II

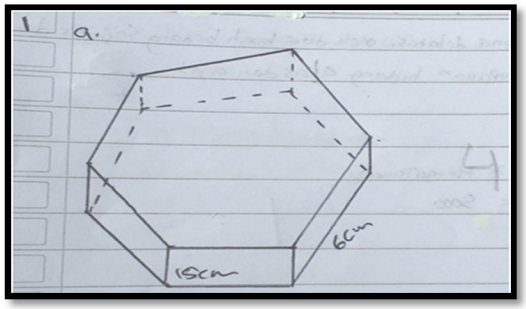
Figure 2. Process Clause Student Answer Question 1 c

Based on Figure 2 can be seen that the students answers on the test I was right but the students did not explain the reason of the answer. While on trial II, the student answers correctly, and students can explain the reason of the answer.

B. Problems for Question No. 1a



(a) Trial 1

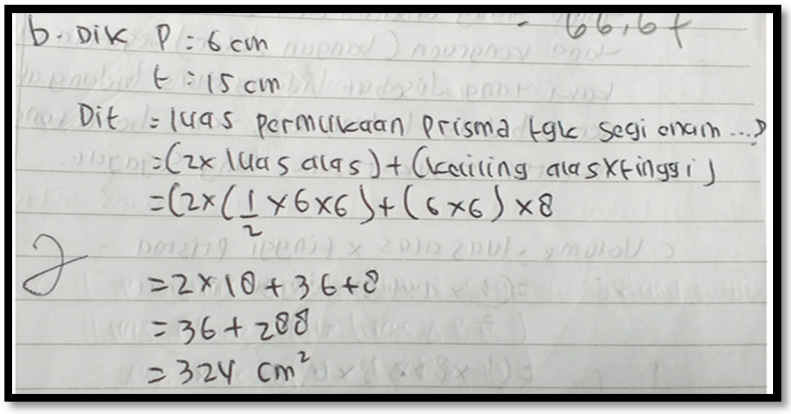


(b) Trial II

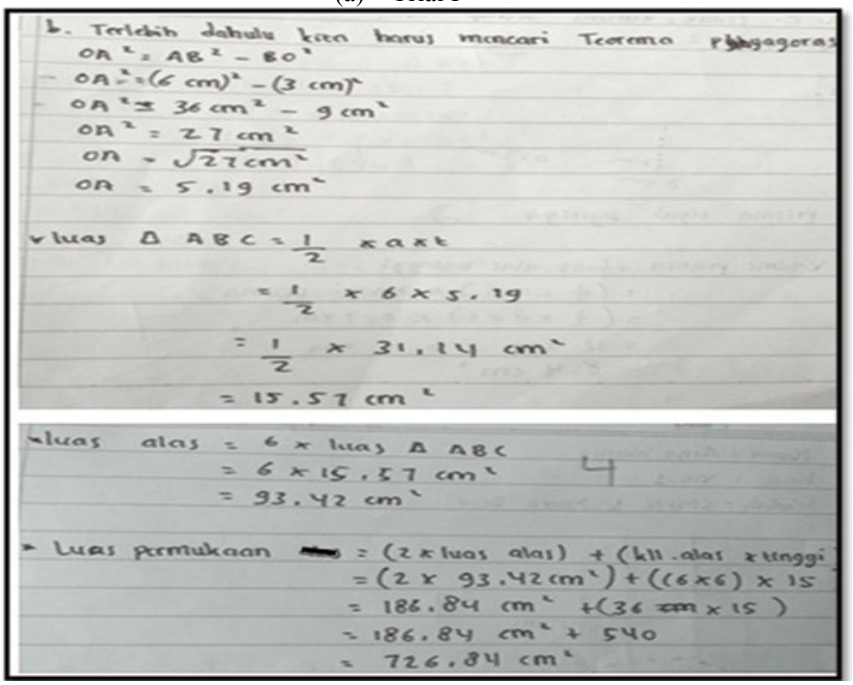
Figure 3. Process Clause Student Answer Question 1 a

Based on Figure 3 it can be seen that the students answers on the test I less than perfect because of the size of each rib is not listed, while the students answers on the test II was perfectly in keeping with the order matter.

C. Problems for Question No. 1b



(a) Trial I

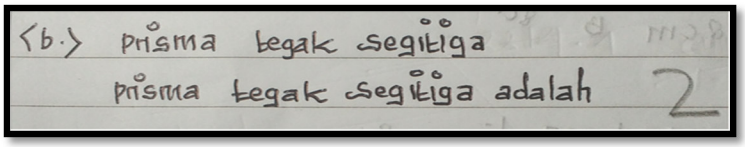


(b) Trial II

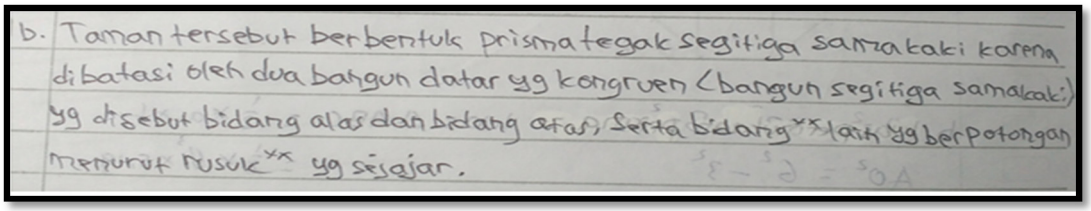
Figure 4. Process Clause Student Answer Question 1b

Based on the figure 4 it can be seen that the trials I can not determine the students high upright triangular field and can not calculate the area of the base prism, Students difficulty determining the area of the base prism-shaped hexagon. While on trial II students have been able to create a mathematical model to calculate the surface area of a prism with a correct and complete.

D. Problems for Question No. 2b



(a) Trial I

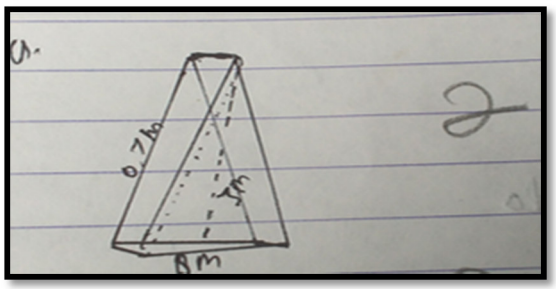


(b) Trial II

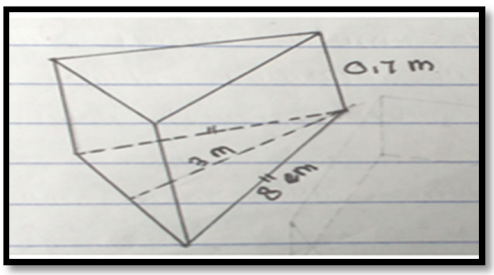
Figure 5. Process Clause Student Answer Question 2b

Based on Figure 5, it can be seen that the students have the trial I can read images, but students can not explain the reason of the answer. While on trial II, students have been able to read drawings and be able to explain the reason of the answer.

E. Problems for Question No. 2a



(a) Trial I

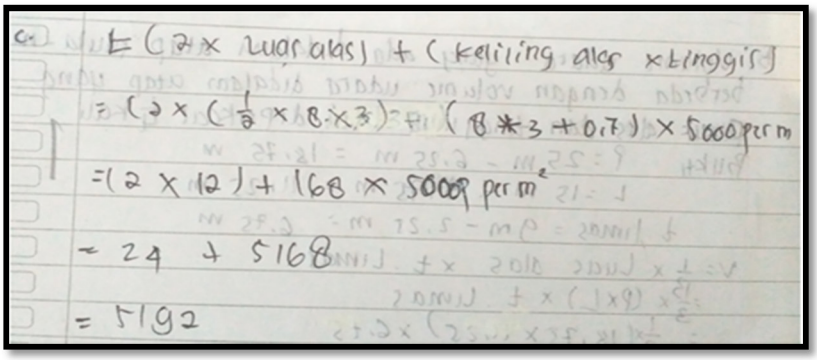


(b) Trial II

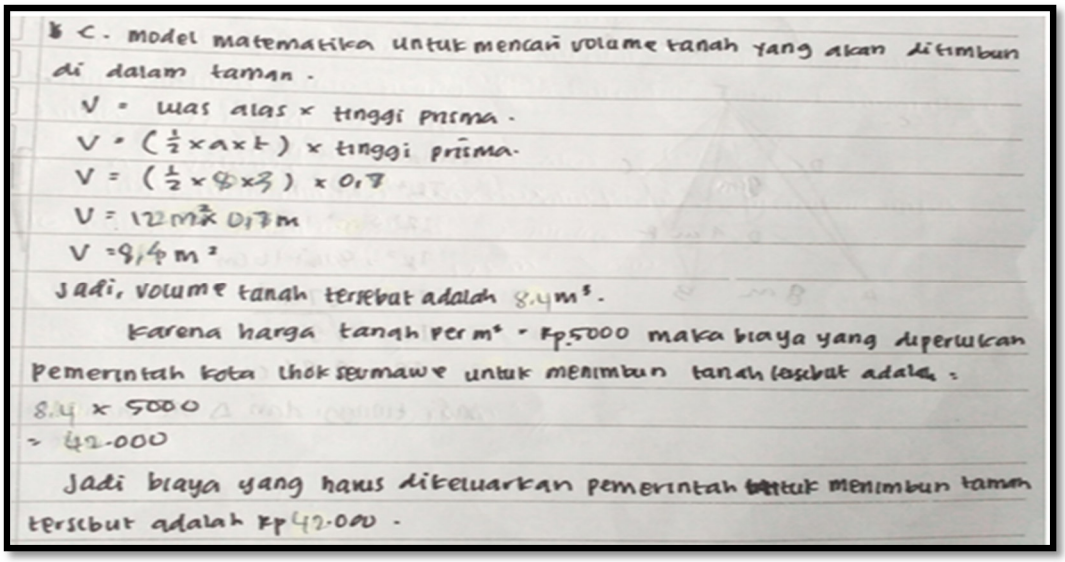
Figure 6. Process Clause Student Answer Question 2a

Based on Figure 6, it can be seen that the students' answers on the test I was not perfect where there are several errors, one of which lies the prism height size written in the picture is wrong. While on trial II, students have been able to draw a triangular prism correctly.

F. Problems for Question No. 2c



(a) Trial I



(b) Trial II

Figure 7. Process Clause Student Answer Question 2c

Based on Figure 7, it can be seen that the trials I students have not been able to make a mathematical model in accordance with orders about. The mathematical model created here is a mathematical model to calculate the surface area of the prism, while the command because that is a mathematical model to calculate the volume of a prism. While on trial II students have been able to create a mathematical model in accordance with orders about. From the description of the process answers the mathematical communication skills of students at the trial I and II, it can be concluded that the students answer on the trial II is better than the process of the students answers on the trial I.

8. Discussion

The results showed that the PBM-BKBA device have valid criteria, practical and effective. Obtaining a valid learning device caused by several factors, including: (1) the PBM-BKBA developed in compliance with the validity of the content. (2), the PBM-BKBA developed in compliance with the construct validity. This is in accordance with the opinion of Akker (1999:10), "validity refers to the extent that the design of the intervention is based on state-of-the-art knowledge ('content validity) and that the various components of the intervention are consistently linked to each other ('construct validity)".Based on the research results and the above opinion, and supported by research and development conducted by Sinaga (2007), which is based on the results of expert validation and revisions have been done shows that, model development and learning tools in the form of Learning Implementation Plans (RPP), books teacher, student books, and LKS is valid and enforceable.

Obtaining a practical learning device caused by several things, among others: (1) Learning Implementation Plan (RPP) made easy to understand and easy to use by teachers and students in the learning process; (2) Steps of PBM-BKBA device easily implemented by teachers; (3) Student Activity Sheet (LAS) which is easily understood by the students prepared for the given instructions clear, easy to read writing, as well as images or tables used easily understood and attractive; (4) Student Book (BS) are arranged with a sentence that is easy to understand and presented in a systematic learning materials; and (5) Sentences questions and statements on tests

of mathematical communication skills and social skills of students attitudes questionnaire unambiguous (meaning more than one) and the process is easy to understand commands.This is in accordance with the opinion of Akker (1999: 10), "Practicality refers to the extent that users (and other experts) consider the intervention as appealingand usable in 'normal' conditions". Based on the research results and opinions on the above, as well as supported by research conducted by Subanti, et al., (2014), shows that the "development of the problem-based learning with a scientific approach to the material triangle which was developed with 4-D model generating device good learning namely practical ".

Based on trial I and trial II results, the PBM-BKBA device developed in compliance with the effective category in terms of: (1) complete learn student in the classical; (2) the activity of students within the tolerance limits specified ideal time; and (3) the students responded positively to the components of PBM-BKBA developed device.

Mathematical communication skills of students meet the completeness criteria in classical caused by the material and the problems that exist in the students books and sheet activities are developed in accordance with the conditions of the learning environment of students and refers to the PBM-BKBA. With the implementation of PBM-BKBA, students will be actively involved in the process of resolving the problem. Students analyze and evaluate their own thinking processes and making inferences from the knowledge that has been found with their guidance and instructions from teachers or friends in the form of questions that lead. It is strengthened with a view Vygotsky (Rusman, 2012: 244), ie, learning by problem is an attempt to relate new information to the cognitive structure that has been acquired through learning activities in social interaction. Furthermore, Vygotsky (Arends, 2008b: 47), adding that the social interaction with others both teachers and peers can refer pengkontruksian new ideas and enhance the intellectual development of students. It is supported by the results of research Saragih & Napitupulu (2015: 110),"student-centered learning model with some learning approach significantly able to improve some mathematics competencies (doing math)".

When viewed from the student activity on trial I andtrial II showed that, of all aspects of the category of activities the student has met the criteria specified ideal time. so it can be concluded that the activity of students using the PBM-BKBA developed device has met the criteria effective in both trials I and trialII. Description given above shows that at the time of student learning is active and has a high spirit in the following study using the PBM-BKBA. This is in line with the opinion of Arends (2008b: 41) which states that the problem based learning model is a model of learning in which students work on authentic problems with a view to construct their own knowledge, and develop independence and confidence. The increased activity of students with problem-based learning supported by research conducted by Marzuki (2012) which states that the activities of the students are given a problem-based learning is effective that meets all the criteria set student activity when compared to direct learning.

The results of the average percentage of student responses on each trial is positive. This means that students responded positively to the components of PBM-BKBA developed device. In learning activities, students often have a problematic situation confusing in ascertaining whether the reasons given solution or a solution that is right or wrong. A problematic situation that is confusing or unclear incurred in connection with the cognitive ability of an individual, where the individual is unable to adjust to the situation cognitive structures encountered in learning, then it is said that there is a cognitive conflict within the individual.In accordance with the above results, PBM-BKBA device is based on the premise that the problematic situation that is confusing or unclear will arouse the curiosity of students so as to make them interested to investigate (Arends, 2008b:52). Furthermore, PBM-BKBA device developed can arouse students interest in learning, causing learning activities to be effective. This is reinforced by the results of research Sinaga (2007) that shows that students respond positively to the device based on the problem-based learning Batak culture.

Associated with the analysis results obtained that the process of the students answers, the students answers on the test II more obtaining the assessment criteria of "good". The process of the students answers on the test II is more structured, systematic, and in accordance with the indicators of mathematical communication capabilities when compared to the students answers on the trial I. The findings are in line with research results Marzuki (2012), which revealed that the students answers with problem-based learning is higher than the direct study visits of each indicator of the problem solving and mathematical communication students.

9. Conclusion

Based on the results of the analysis and discussion in this study, presented some conclusions as follows:

1) The KBM-BK developed device is valid, practical and effective.
   a. PBM-BKBA device developed included in the category valid with an average total value of RPP validity of 4.60, student book for 4.60, LAS amounted to 4.60, test items mathematical communication skills and attitudes questionnaire point statement also social skills has been on a valid category;
   b. PBM-BKBA device developed in compliance with the terms of practical criteria: (1) the assessment of experts/practitioners declare that the PBM-BKBA developed can be used with little revision; and (2) the

adherence to the PBM-BKBA has reached a very high category as well as the observation sheet enforceability of the PBM-BKBA have achieved good reliability;

c. PBM-BKBA device developed meets the criteria effectively. Criteria effective in terms of: (1) the classical mastery learning students has reached 92% in the second test; (2) the activity of students during activities meet the criteria specified tolerances ideal time; and (3) a positive student response to the device components of learning and learning activities developed.

2) There is increased communication capabilities of mathematical and social skills of students using the PBM-BKBA device. The average achievement of students mathematic communication ability of the trial I amounted to 74.25 increased to 8.33 in the trial II, while the average achievement of students social skills at the trial I of 90.6 rose to 97.48 on trial II.
3) The process of student answers on trial II is better than the students answers on the trial I.

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