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The Development of Mathematic Lesson Plan to Increase Mathematic Communication Ability Students Through The Model of Problem Based Learning Contextually in Java Culture

Sri Mentari[1], S. Saragih[2], Mulyono[3]
[1](*Postgraduate, State University of Medan, UNIMED*)
[2,3](*Lecturer, State University of Medan, UNIMED*)

Abstract: This study aims to analyze: 1)The mathematic lesson plan which is developed through model of problem-based learning contextually on Java culture (PBL-CJC) to meet valid, practical and effective criteria, and 2) The Improvement of mathematic communicative understanding ability of junior high school students using the PBL-CJC lesson plan. This research is a development research conducted through two steps. The first step, developed the lesson plan using 4-D model, and then tested the lesson plan in class VIII / 2 and VIII / 1 SMPN 1 Beringin. And the result were obtained ; 1) PBL-CJC lesson plan have valid criteria , practical and effective 2) there are Improvement of students' mathematic communicative understanding ability using PBL-CJC lesson plan.

Keywords: PBL-CJC lesson plan. Mathematic communication ability

I. INTRODUCTION

PERMENDIKNAS No. 22 of 2007 [1], one of the objectives of mathematics subjects for junior high school is that students are able to communicate ideas with symbols, tables, diagrams, or other media to clarify the situation or problem. This ability is also called mathematical communication ability.

Mathematical communication ability are one of the abilities that students must possess because communication skills can be useful for their future lives by Wichelt and Kearney [2]. Therefore, communication skills must be one of the aspects developed in mathematics learning. Greenes and Schulman [3] say that: Mathematical communication is: (i) the central power for students in formulating mathematical concepts and strategies, (2) the capital of success for students towards approaches and solutions in mathematical exploration and investigation, (3) a place for students in communicating with friends to obtain information, share thoughts and discoveries, brainstorm, assess and sharpen ideas to convince others.

But in reality, students' mathematical communication skills are still low. This can be seen from the results of field observations at Beringin 1 State Middle School. Students still experience difficulties in understanding and changing questions into mathematical models, then making mistakes in interpreting the questions. If analyzed from students' answer errors from 35 students, only 4 people around 11% answered correctly without errors, 9 (25%) people answered correctly but there was a concept error, 16 people (45%) answered incorrectly due to operating errors and 6 people (17%) did not answer. From the analysis of student answers above shows that students' mathematical communication skills are still low.

The low mathematical communication skills are caused by many factors, Saragih[4] said including the learning process that is still teacher oriented paradigm. In class interaction among students and students to teacher rarely exists. Teacher dominates the teaching and learning process which implies less chance to students to develop themselves through learning that designed to invent concepts. Responding to the problem of low students' mathematical communication skills, the teacher must make efforts to improve these conditions. Efforts made include improving quality through the learning process. Teachers are required to effectively describe mathematics learning activities in the form of valid, practical and effective learning tools to improve mathematical communication skills by Volkan's thought, Wong [5].

The literature review reveals that the importance of lesson planning is emphasized in the education process of many countries. Borich[6] states that as a combination of lesson objective designing, teaching, modeling, checking for understanding, re-teaching and teacher's self-reflection, lesson plan is a crucial element in the process of meeting national content standards and optimizing the outcome of classroom teaching and learning. But in reality, after observing at Beringin 1 Middle School, the use of valid, practical and effective learning tools in improving students' mathematical abilities is still not applied in the learning process. The availability of quality learning tools is one of the factors that can support the learning process. So it is necessary to make efforts to develop learning tools that are in accordance with the needs of students in improving mathematical communication skills.

In addition to the use of quality lesson plan, to improve mathematical communication skills students need an appropriate learning model application. The right learning model to improve students' communication skills is The Model of Problem Based Learning Contextually On Java Culture. The Model of Problem Based Learning Contextually On Java Culture (PBL-CJC) is a modification of a problem-based learning model that is integrated with Java culture. This refers to the Philosophical Foundation of the 2013 Basic Framework Curriculum, which suggests that the educational process developed through learning activities is expected to be able to integrate national cultural values.

From the description of the above problems, the researcher concludes that it is necessary to have a study related to the availability of a lesson plan that can improve students' mathematical communication ability combined with the application of problem-based learning models in Javanese cultural context. This study aims to analyze: 1) The mathematic lesson plan which is developed through model of problem-based learning contextually on Java culture (PBL-CJC) to meet valid, practical and effective criteria, 2) The Improvement of mathematic communicative understanding ability of junior high school students using the PBL-CJC lesson plan.

To support the research that will be carried out, the development of this culture-based learning tool has also been examined by previous research conducted by Aufa [7] showing that "1) The PBM-BKBA that developed has valid criteria, practical and effective; 2) There is an increased ability of mathematical communication and social skills of students using the PBM-BKBA developed.

II. LITERATURE

A. Communication Mathematics Ability

In general communication can be interpreted as an event conveying information from the communicator to the communicant in a community and cultural context. Keyton [8] said, "Communication can be defined as the process of transmitting information and common understanding from one person to another".

Associated with mathematical communication, The Intended Learning Outcomes at Husna [9], reveals that mathematical communication is an important skill to express mathematical ideas coherently to friends, teachers and others through spoken and written language. So if defined mathematical communication ability is a student's ability to convey something that is known through dialogue events or relationships that occur in the classroom environment, where there is a message transfer. The message is transferred contains about the mathematics material that students learn, for example in the form of concepts, formulas or strategies for solving a problem . Mathematical communication must be developed on every mathematical topic.

These five aspects if used to measure students' mathematical communication skills in mathematics learning are stated in indicators, for example the indicators put forward by Hendriana&Sumarmo [10], namely; 1). Describe and present real objects, images and diagrams in the form of ideas and or mathematical symbols; 2).Describe mathematical ideas, situations and relations verbally and in writing using real objects, images, graphs and algebraic expressions; 3). State everyday events in a language or mathematical symbol or construct a mathematical model of an event; 4). Listen, discuss, and write about mathematics; 5).Reading with understanding of a mathematical presentation; 6). Arrange conjectures, compile arguments, formulate definitions, and generalize; and 7). veal a description or paragraph of mathematics in their own language.

In this study, mathematical communication ability are limited to written communication, which are grouped into three, namely (1) explain the idea or situation of an image that is explained in its own words in writing; (2) Stating a situation with a picture; and (3) state the situation into a mathematical model.

B. Lesson Plan

Lesson plan are a set of learning resources that allow students and teachers to carry out learning activities. According to Ibrahim in Trianto [11],lesson plan are devices used in the learning process. Lesson plan function to provide direction for the implementation of learning so that it becomes directed and efficient.

From the description above it can be concluded that the learning device is a number of materials, tools, media, instructions, and guidelines that will be used by students and teachers in the learning process. So the development of lesson plan is a process carried out to produce a series of learning tools used by teachers and students in the learning process in the classroom. a set of learning tools that a teacher must prepare in dealing with classroom learning, including: (a) syllabus, (b) Learning Implementation Plans; (c) Student Books; (d) Teacher handbook ; (e) Student Activity Sheet ; (f) Learning ability test. But in this study, the lesson plan developed are: a) syllabus, (b) Learning Implementation Plans; (c) Student Books; (d) Teacher handbook ; (e) Student Activity Sheet ; and (f) Learning ability tests (mathematical communication ability).

C. The Model of Problem Based Learning Contextually On Java Culture (PBL-CJC)

The Model of Problem Based Learning Contextually On Java Culture (PBL-CJC) is based on learning theory that embraces the constructivism that underlies the PBL model and pays attention to mathematical characteristics and uses of aspects of Javanese culture. The PBL-CJC model is the result of modification or improvement of the PBL model by taking into account the characteristics of mathematics, the purpose of learning mathematics, and the utilization of aspects of culture (Javanese culture) that greatly affect mental activity and development. According Rusman [12] Problem-based learning model refers to 5 (five) main steps of learning, namely: (1) student orientation to the problem; (2) organizing students to study; (3) guiding individual or group investigations; (4) develop and present works; (5) analyzing and evaluating the problem solving process. The modification made in this PBM model is that there is in the first stage "student orientation on the problem" in which it is necessary to confirm that various problems designed by the teacher must come from the facts and cultural environment in which the student is located. That is, the problem raised is not only related to the real life and experience of students, where in this study is devoted to the context of Java culture.

III. RESEARCH METHODOLOGY

Subjects in this study were students of class VII SMP N 1 Beringin academic year 2017/2018, where as the object of this research is the PBL-CJC on the material integers, mathematical communication ability of students. The first trial was conducted in classes VII /2 and a second test is done in class VII /1.

A. Validity of Lesson Plan Based on PBL-CJC

Lesson plan developed based on PBL-CJC were validated by five assessors. According to Sinaga[13] the criteria for projects based on PBL-CJC are as follows;

TABLE 1 Level of Criteria Validity

No	Va or value of average total Validity of	validity Criteria
1	$1 \leq Va < 2$	Invalid
2	$2 \leq Va < 3$	less valid
3	$3 \leq Va < 4$	Quiet Valid
4	$4 \leq Va < 5$	Valid
4	$Va = 5$	Very Valid

Annotation:

Va is the value of determining the level of prevalence and learning devices using PBL-CJC

Meanwhile, According to Arikunto[14] to calculate the validity and Ability of communication mathematical test learning questionnaires used product moment correlation formula that is:

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

Annotation:

X : Score item

rxy: test validity coefficient

Y : The total score

N : many respondents who took the test

Determining the royalty coefficient of a form test description used the alpha formula 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} : test reliability coefficient

n : number of test items

σ_I^2: total variance

B. Practicality of Lesson Plan Based on PBL-CJC

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

Very Low , If 0 = P < 1

Low , If 1 = P < 2

Enough, If 2 = P < 3

High, If 3 = P < 4

Very High, If 4 = P = 5

Annotation:

P is the average score

PBL-CJC lesson plan is said to be practical or easy to implement if the enforce ability of the PBL-CJC are in the category of high minimal

C. Effectiveness of Lesson Plan Based on PBL-CJC

PBL-CJC lesson plan are said to be effective when viewed from (1) classical student learning completeness, i.e. at least 85% of students who take part in learning are able to achieve a score of ≥ 71 or a minimum of B; (2) achievement of learning goals 75%; (3) minimal learning time is the same as ordinary learning, and (4) A minimum of 80% of the many subjects studied gave a positive response to the components of the Javanese contextual problem-based learning lesson plan developed.

According to Trianto[15] percentage can be calculated by the formula:

$$PKK = \frac{\text{Number of Students Who Completely Study}}{\text{Number of All Students}} \times 100\% \quad (3)$$

Annotation:

PKK : Percentage of Classical Completeness

To see the achievement of learning objectives, each item questions about the test items of mathematical communication skills used by the formula

$$T = \frac{\text{Number of student scores for points to}-\text{i}}{\text{The maximum number of points to}-\text{i}} \text{ x } 100\% \qquad (4)$$

Its criteria are:

0 % ≤ T< 75 % : Learning objectives have not been achieved

75 ≤ T ≤ 100 %: Learning objectives are achieved.

Student questionnaire responses were analyzed by using the formula below, According to Herman[16] to set with the formula, namely:

$$PRS = \frac{\sum A}{\sum B} \times 100\% \qquad (5)$$

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)

D. Improved The Ability to Communication Mathematic

To analyze the increase in mathematical communication students use the average n gain as a comparison. Namely by digging the average n-gain in trial I and trial II. According to Hake [17] Say to set n-gain with the formula, namely:

$$\text{gain } = \frac{\text{postest value}-\text{pretest value}}{\text{ideal value}-\text{pretest value}} \qquad (6)$$

IV. RESULT

A. Analysis Validity of PBL-CJC Lesson Plan Developed

The study was conducted in two trials. Where trial II is done because there are still unfulfilled criteria in test I. Before the learning device and research instrument (draft I) is tested, first draft I is validated to five valuators. The validation results of teaching materials developed by 5 valuators are valid and can be used with "small revisions". Validation results by 5 valuators are presented in the following Table 2.

TABLE 2 Summary of Results Validation Learning Device

The Lesson plan	**The average value of total validity**	**Category**
Syllabus	4,60	Valid
Learning Implementation Plan	4,50	Valid
Student Activity Sheet	4,60	Valid
Teacher Book	4,60	Valid
Students book	4,60	Valid

Then the mathematical communication ability test instrument were tested on out-of-class samples. The results obtained that the instrument developed "can be used or valid" with the reliability value of pretest understanding of mathematical communication ability 0.672 (very high category) and posttest the ability of understanding communication ability of 0.643 (very high category).

B. Analysis Practicality of PBL-CJC Lesson Plan Developed

Based on the results of the analysis of the observation data on the implementation of the for each meeting in the trial and for the experiments in Table 3 below.

TABLE 3 Value of Observation on the Implementation of Try Out lesson Plan

Average overall of 2 observers	Meeting $\overline{P_2}$				Total average $\overline{P_3}$	Information
	1	2	3	4		
Trials 1	3,95	4,02	4,15	4,18	4,07	very high (practical)
Trials II	4,08	4,29	4,37	4,45	4,29	very high **(practical**

Based on Table 3, it was found that the overall implementation of the lesson plan in the first trial and the second trial were 4.07 and 4.29, which if referred to the criteria for the implementation of the lesson plan specified, the average score of

4,07 and 4.29 are in the very high category ($4 \leq \bar{P} \leq 5$). Thus it can be concluded that, the PBM-CJC devices developed are practical in terms of the feasibility of lesson plan. Then when viewed from the reliability of the feasibility of the lesson plan shown in Table 4 as follows.

TABLE 4. Instrument Reliability of PBL-CJC lesson planin Trial

TRIALS	MEETING				% RELIABILITY	INFORMATION
	1	2	3	4		
1	78,08	79,62	82,69	85,00	81,35 ≥ 75	GOOD
II	82,69	85,77	86,92	89,23	86,15 ≥ 75	GOOD

Based on Table 4, the reliability of PBL-CJC equipment for I and II trials is 81.35% and 86.15 ≥75%. So because the reliability of PBL-CJC devices has reached ≥75%, PBL-CJC devices meet the criteria practicality.

E. Analysis effective of PBL-CJC Lesson Plan Developed

Based on the results of the mathematical communication ability of the first trial students, the number of students who completed the learning classically was 25 out of 31 students (80.65%) and the number of students who were not complete were 6 of 31 students (29.35%) . In accordance with the criteria of classical student learning completeness, post testing mathematical communication skills in trial I did not meet the criteria for achieving classical completeness. Then when viewed from the achievement of the learning objectives, the results of mathematical communication skills in the first trial showed that the achievement of learning objectives in problem number 1, number 2, number 3, number 5 and number 6 was obtained at 86.02%, 87.37%, 77 , 96%, 77.42% and 77.87%. In accordance with the criteria for the achievement of learning objectives, said to have been achieved while the unreachable is item 4 with the achievement of learning goals of 61.56%. The learning time of the PBL-CBJ model is the same as ordinary learning. Then the average analysis results for each aspect of student response are as follows: (1) 95.4% of students expressed pleasure in the components of the PBM-BBJ device; (2) 91.98% of students stated the components and learning activities were still new; (3) 100% of students stated that they were interested in taking mathematics lessons in other material such as learning that was carried out; (4) 98.7% of students stated the language in the student's book, the LAS and the test were clear; and (5) 94% of students expressed interest in the appearance of student books and LAS. The average percentage of the total positive response of students in the first trial was 95.01%. If the results of this analysis are referred to the criteria set out in chapter III, it can be concluded that the student's response to the components and learning activities is positive.

Based on the results of the first trial data analysis, it is known that the learning devices developed have not been effective, because there are still some indicators of effectiveness that have not been achieved, such as not meeting the criteria for achieving classical completeness, and the achievement of learning objectives have not reached the specified criteria. So, it is necessary to conduct trial II which is the result of improvements from the I. trial.

In trial II, students who completed classical learning were 28 out of 31 students (90.32%) and incomplete students were 3 out of 31 students (9.68%). In accordance with the classical student learning completeness criteria, it can be concluded that the results of communication t the experimental stage have achieved good results. Aired from the achievement of the learning objectives, the results of mathematical communication in the trial II showed that the achievement of learning objectives in problem number 1, number 2, number 3, number 4, number 5 and number 6 was obtained at 87.90%, 83.60% , 86.29%, 81.99%, 84.41% and 86.02%. The learning time in PBL-CJC is the same as ordinary learning time. Then when viewed from the students' responses, the results for each aspect of student response are as follows: (1) 97.4% of students expressed pleasure in the components of the PBM-BBJ device; (2) 94.8% of students reveal components and learning activities are still new; (3) 100% of students expressed interest such as learning mathematics on other material; (4) 100% of students do language on student books, LAS and tests are clear; and (5) 94% of students expressed interest in the appearance of student books and LAS. The average percentage of the total positive response of students in the second trial was 97.44%. If the results of this study are referred to the criteria set out in chapter III, it can be concluded that the students' response to the components and learning activities is positive. Because, more than 80% of students gave a positive response to the components of PBL-CJC devices that were developed. Based on the above provisions, there are those who have effective learning, but PBL-CJC devices can be concluded

F. Improvement of Mathematical Communication Ability in Trial I and Trial II

Data obtained from the pretest and posttest results of students 'mathematical communication skills in trial I and trial II were analyzed to determine the improvement of students' mathematical communication skills by comparing the average n-gain in test I and trial II. Description of the improvement of students' mathematical communication skills using PBL-CJC lesson plan in trials I and II is shown in Table 5

TABLE 5 Description of Mathematical Communication Ability Results

Information	Trials **I**		Trials **II**	
	Pretest	postest	Pretest	Posttest
The highest score	65	92	71	97
lowest value	32	68	26	69
Average	47	77,20	45	85
n-gain average	0,54		0,71	

Based on Table 5, the results of the analysis of the improvement of students 'mathematical communication skills in the I and II trials showed that the average students' mathematical communication skills on the posttest results in trial I was 77.20 increasing to 85 in the trial II. This is in accordance with the data analysis of the improvement of mathematical communication skills in chapter III, namely the improvement of mathematical communication seen from the average posttest results of trials I and II, thus it is known that an increase in the average value of students' mathematical communication skills is 7.8. Furthermore, when the gain test is done, the average n-gain for trial I is 0.54 and the second test is 0.71. The value of n-gain test I and n-gain trial II has increased by 0.17. Furthermore, a description of the improvement of students' mathematical communication skills by using PBL-CJC lesson plan in trials I and II for each indicator of mathematical communication skills can be seen that the average pretest and posttest indicator I of students' mathematical communication skills in the first trial were 2.16 and 3.29; indicator II is 1.85 and 3.04; and indicator II is 1.58 and 2.95. In the second trial, the average pretest and posttest indicator I students' mathematical communication skills were 1.90 and 3.46; indicator II is 1.51 and 3.30, and indicator III is 1.96 and 3.46. When viewed from the value of the indicator can be concluded that each indicator has increased. Then when the n-gain test is performed, the average n-gain is presented in Table 6 as follows.

TABLE 6 Average n-gain of Trial I and Trial II

Information	**Indicator 1**	**Indicator 2**	**Indicator 3**
n-gain trials I	0,517	0,556	0,561
N-gain trial II	0,734	0,718	0,735

Based on Table 6, the average value of n-gain indicator I in the second trial was higher than the trial I (0.73> 0.51). On indicator 2 the average n-gain test II is higher than test I (0.718> 0.556), and on indicator 3 the average n-gain test II is higher than test I (0.735> 0.561). This shows that students' mathematical communication skills using PBL-CJC lesson plan have increased from trial I to trial II. Thus, it is concluded that PBL-CJC lesson plan can improve students' mathematical communication skills.

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Based on the results of the research, the discussions and conclusions that have been presented can be suggested that the ability of communication mathematic is recommended that should be focus on activity high order thinking.

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