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Development of Learning Devices Based on Realistic Approach Integrated Context Malay Deli Culture To Improve Ability of Understand Mathematical Concepts and Students' Self-Regulated Learning At SMP Negeri 5 Medan

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Abstract: *This study aims to: 1) Develop learning devices based on realistic approach integrated Malay Deli cultural context that meets valid, practical, and effective criteria; 2) Describe the enhancement of ability of understand mathematical concepts using the developed PR-TKBMD-based learning devices; and 3) Describe the improvement of students' self-regulated learning using the developed PR-TKBMD-based learning devices. This research is a development research using 4-D model done in two stages, namely: 1) developing the device, and 2) testing the device. The subject of this research is the students of class VII of SMP Negeri 5 Medan. The object of this study is the learning devices based on PR-TKBMD developed, the ability of understand mathematical concepts, and the questionnaire of students' self-regulated learning. The results showed: 1) Learning devices based on PR-TKBMD developed have met the valid, practical and effective criteria; 2) There is an increased ability to understand mathematical concepts after using the PR-TKBMD-based learning devices; and 3) There is an increase in student self-regulated learning after using the PR-TKBMD-based learning devices.*

Keywords: *development of learning devices, 4-D model, PR-TKBMD, ability of understand mathematical concept, student's self regulated learning.*

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I. Introduction

Mathematics is the subjects given in every level of education in Indonesia from Primary, Secondary, High School to Higher Education. Mathematics can assist students in developing logical thinking, analytical, systematic, critical, and creative as well as ability to cooperate. Mathematical ability is very important developed to build student cognitive development as an effort to improve student learning result of mathematics. This is in line with the general objectives of mathematics learning formulated by the National Council of Teacher Mathematics (2000), namely: (1) learning to communicate (mathematical communication); (2) learning to reason (mathematical reasoning); (3) learning to solve problems (mathematical problem solving); (4) learning to link ideas (mathematical connection); (5) the formation of positive attitudes toward mathematics in Somakin, 2010 [1]. The above description shows that students 'mathematical skills are a very important factor for students' cognitive development and influence learning outcomes.

In fact, the TIMSS research report in 2011 [2] suggests that the achievement of Indonesian students' mathematics in 2011 is ranked 38 out of 42 with a score of 386. Indonesia's score fell 11 points from the 2007 score. Indonesian students' mathematics score is far below the international average score.

Based on the results of research by Saragih [3] in 2015, students' high-order thinking skills, especially in solving mathematical problems, mathematical understanding, and mathematical communication increased significantly. By analysis, instrument reliability on mathematical comprehension, mathematical problem solving, and mathematical communication ability are quite good.

The ability to comprehend mathematical concepts is one of the important objectives in learning mathematics, giving the understanding that the materials taught to students are not just as memorization, but more than that with the understanding of students can better understand the concept of the subject matter itself. Zulkardi [4] in 2007, says that "mathematics subjects emphasize the concept". This means that in learning mathematics students must understand the concept of mathematics in advance in order to solve the problems and able to apply the learning in the real world.

Afrilianto [5] in 2012 states that ability of understand mathematical concept is the ability to understand concepts, operations and relationships in mathematics. Abstract mathematical concepts allow us to group (classify) objects or events to be able to declare examples or non examples of concepts. In addition to the

importance of ability of understand mathematical concept, other things that are considered important is the attitude of students in learning mathematics, one of which is student learning independence. Independence in learning is a necessity and demand in education today. Fahradina, et al, [6] in 2014 states that independence is an individual capable of dealing with his problems and acting maturely. Meanwhile, according to Fahradina, et al, [7] in 2014 revealed the main characteristic of self-study is the development of students' ability to do the learning process that does not depend on the factors of teachers, friends, classes and others.

One important factor that can improve mathematical ability is to conduct quality learning by making the right learning device. The use of learning devices provides good benefits in learning. The purpose of developing learning devices is to improve and produce a new product. In addition, it aims to produce learning devices that are able to solve the problem of learning in the classroom, because in essence there is no single source of learning that can meet all kinds of learning process needs. In other words the selection of learning tools, need to be associated with the goals to be achieved in the learning process, especially in improving students' mathematical skills, especially the ability of understand mathematical concepts and students' self regulated-learning.

Therefore, it is important for teachers to be able to develop learning tools to support the effectiveness and efficiency of learning, so that what is the goal in learning can be achieved well. A learning device is said to be qualified if it meets the valid, practical, and effective criteria.

Responding to the problems that arise in the learning of mathematics as described above, especially with regard to the ability of understanding mathematical concepts, students' self-regulated learning and learning devices, it is necessary for teachers or researchers to choose the learning that can change the paradigm. Realistic approach is one of the solutions. According to Susanti [8] in 2012, in general the realistic approach is the orientation approach towards realistic students' understanding aimed at the development of practical, logical, critical and honest mindset oriented by understanding the mathematical concept in solving the problem.

The realistic approach provides an opportunity for students to reinvent mathematical ideas and concepts with adult guidance through exploration of real-world situations and issues. The process of developing concepts and mathematical ideas that started from the real world by De Lange [9] in 1996 is called conceptual mathematization and has a schematic model of the learning process. Three main principles in the realistic approach, namely Gravemeijer [10] 1994: guided discovery and progressive mathematization; Didactic phenomena; independent model development. Guided discovery implies that students are given the opportunity to find their own mathematical concepts by finding solutions to contextual problems. Contextual issues provide direction for students to form concepts, model, apply known concepts, and solve them based on applicable mathematical rules. Didactic phenomena are situations given in a mathematical topic presented on two considerations, namely to see the possibility of application in learning as a starting point in the process of learning mathematization. The principle of developing a self-developed model serves to bridge the gap between the informal mathematical knowledge and the formal mathematics of the students. Mathematical models are developed and developed independently based on mathematical models already known to students.

The success of teaching and learning process is strongly influenced by student environment. It's good in developing learning tools using realistic approach integrated with the daily life of students. Where the Device is designed by associating the content domain of the material with the inherent culture of the student itself. Rohaeti [11] in 2011 mentions: "For students to feel that the material they learn in mathematics is a part of themselves then the learning of mathematics must begin with the contextual learning of the culture where the students are located." Culture is an activity that is attached to a particular society. The mathematics teaching in school and mathematics that children find in everyday life is very different. Based on the Basic Philosophical Platform of the Curriculum Basic Framework 2013, Indonesia's education should be rooted in the nation's culture to build the life of today's nation and the future.

To support the learning that is integrated with the local culture, it is necessary to develop learning tools that can foster students' appreciation of the culture. In the preparation of learning tools that are integrated to the culture then the learning design departs from the local cultural theme. Mathematics learning can also be integrated into local culture. Therefore, mathematics learning is very necessary to provide a charge / bridge between math in the everyday world based on local culture with school mathematics. Especially for in North Sumatra is one culture that can be integrated into the learning of mathematics is Malay culture Deli.

Judging from the framework of developing a renewal of the education system, the adoption of a realistic approach based on the local cultural context (Malay Deli culture) is in line with the idea of decentralization of education currently being echoed. That decentralization is an effort to improve the effectiveness and efficiency of education and is expected to develop the ability of regions to increase their potential independently. Therefore, the development of learning tools through realistic approach based on the local cultural context (Malay Deli culture) is needed to enrich students' mathematical knowledge, improve the ability to comprehend mathematical concepts and student learning independence, enable students to face global challenges and also bring students closer to their cultural environment.

From the description of the above problems, it is possible to overcome the problems related to the low ability of understanding mathematical concepts and student learning independence, it is very important in developing learning tools with realistic approach based on cultural context (Deli Melayu Culture), this research entitled Development Learning Tool Based Realistic Approach Integrated Deli Context Malay Culture To Improve Ability Understanding Mathematical Concept and Self-Reliance Learning Junior High School Students In SMP Negeri 5 Medan.

II. Literature

Understanding Mathematical Concepts

Understanding is one of the abilities that every student should possess. If students have the ability to understand a problem well, it is expected to solve or solve the problem properly. Ruseffendi [12] also suggests that the concept is an abstract idea that allows us to classify objects and classify whether they belong to the abstract idea. Meanwhile, Afrianti [13] in 2012 states that the concept is an abstract idea that allows one to classify objects or events, so as to determine whether the object or event is an example or not an example of the idea.

NCTM 1989 [14] also states indicators of achievement of understanding of mathematical concepts can be seen from: (1) Defining verbal and written concepts, (2) Identifying examples and not examples, (3) Using models, diagrams and symbols to represent a concept, (4) Changing a form of representation into another form, (5) Knowing various meanings and concepts, (6) Identifying the properties of a concept, (6) Identifying the properties of a concept, (7) Comparing and distinguishing concepts -the concept of Purwanto [15] in 1995 reveals that "conceptual understanding is a level of ability that expects students to be able to understand known concepts, situations, and facts, and can explain in their own words according to the knowledge they possess, by not changing it".

Based on the above description, understanding of mathematical concepts in this research is the ability to understand the concept and use the procedure more widely, accurately and accurately in understanding the concept. In this study the ability to understand the concept is the absorption of the meaning of mathematical material and understanding of student concepts are viewed from: 1) Re-state a concept 2) Provide examples and not examples of concepts 3) Apply the concept into problem solving.

Student Learning Independence

According to Ellianawati [16] in 2010, stating that, self-regulated learning is a learning situation where learners have control over the learning process through knowledge and application of appropriate strategies, an understanding of their tasks, decision and motivation to learn. Schunk and Zimmerman [17] in 2011 define it as a learning process that occurs because of the influence of thought-oriented thoughts, feelings, strategies, and behaviors that are goal-oriented.

According to Tanriseven [18] in 2014 which asserts that the learning process embodied through student learning independence includes; opportunities provided to individuals in managing their learning process; exercises used to activate knowledge; elaboration provides a new learning relationship with early learning; connecting past knowledge with the new; control of the time and environment in which students can manage their own environments and strategies in learning.

The indicators of learning independence by Sumarmo [19] in 2003 are: (1) learning initiative; (2) Diagnose learning needs; (3) Organize and control the progress of learning; (4) Establish target and learning objectives; (5) Viewing difficulties as a challenge; (6) Seek and utilize relevant learning resources; (7) Selecting and implementing learning strategies; (8) Evaluating learning processes and outcomes; (9) Self-concept, and the indicators will be used to see the extent to which student self-sufficiency and improvement in this research.

Realistic Approach Integrated Context of Deli Malay Culture (PR-TKBMD)

Integrated Realistic Approach The Context of Deli Malay Culture (PR-TKBMD) is based on a theory of learning that embraces the constructivism that underlies the realsytic approach and gives attention to the characteristics of mathematics and the utilization of aspects of Malay culture of Deli. PR-TKBMD is a learning model that emphasizes the process of full student involvement by applying the context of Malay Deli culture to be able to find the material learned and relate it to real life situations so as to encourage students to apply it in real life.

Culture is very decisive how the perspective of students in addressing something, including in understanding a mathematical material. This is in line with Tandililing [20] 2013, that culture will influence individual behavior and have a large role in the development of individual understanding, including mathematics learning. This means that when a material is so far removed from the cultural scheme they have that it is difficult to understand. For that we need an approach or strategy in learning mathematics that can connect between mathematics with their culture.

Culture-Based Learning (ethnomathematics) is one of the alternatives that can bridge mathematics with culture. Sutama, et al., [21] in 2013 says that culture-based learning is a strategy for creating learning environments and designing learning experiences that integrate culture as part of the learning process. The same is also expressed by D'Ambrosio namely Ethnomathematics, which is the study of mathematics within its diverse cultural contexts, is used to express relationships between culture and mathematics. D'Ambrosio reveals that Ethnomathematics is a mathematical learning in diverse cultural contexts, used to express the relationship between culture and mathematics.

Local-based math-based learning is designed to focus on the material associated with the local culture in which the student originated. According to the Rohaeti [22] in 2011 said that the learning of local culture-based mathematics is one of the perceived ways to make meaningful and contextual learning that is closely related to the cultural community where a field of science is studied and will be applied later with the community where learners come from .

The steps of learning PR-TKBMD almost the same as the steps of realistic approach only in inserted Malay culture Deli into it. Based on the above description, the learning procedure using realistic approach is integrated into Deli Malay cultural context (PR-TKBMD), namely: (1) Understanding the contextual problems related to Malay culture Deli, (2) Explaining the contextual problem related to Malay Deli culture, 3) Resolving contextual issues related to Malay culture of Deli, (3) Comparing and discussing answers, and (5) Summing up or finding knowledge (Reinvention).

III. Research Method

This research is a development research using 4-D development model Thiagarajan, Semmel, and Semmel [23] in 1974 consisting of 4 stages, define, design, develop, and disseminate.

Subjects and Research Objects

Subjects in this study are students of class VII-1 and VII-2 SMP Negeri 5 Medan academic year 2017/2018, while the object in this study is learning devices developed by using PR-TKBMD on fractional material. Learning devices developed are Learning Implementation Plan, Teacher's Book, Student's Book, Student's Worksheet, Ability of Understanding Mathematical Concept test and questionnaire students' self-regulated learning. Development of learning devices using the Thiagarajan 4-D development model. However, the disseminate stages are not performed.

Instruments and Data Analysis Techniques

Instruments in this study using tests, questionnaires and observation sheets. For more details are presented in table 1.

Table 1 Data Analysis Instruments and Techniques

Rated Aspect	Instruments	The Observed Data	Respondents
Validity of PR-TKBMD learning tools	Validation Sheet	Learning Implementation Plan, Teacher's Book, Students's Book, Student's Worksheet, Ability of Understand Mathematical concept, Self-Regulated Laerning	Expert/Specialist
Practicality of PR-TKBMD learning tools	Observation Sheet	Learning Devices Implementation	Observer
Effectiveness of PR-TKBMD learning tools	Test	Ability of Understand Mathematical Concept Test	Student
	Observation Sheet	Teacher's Ability to Manage Learning	Observer
	Questionnaire	Student's response	Student

Validity of Learning Device Based on PR-TKBMD

Learning tools developed based on PR-TKBMD are validated by five validators. Criteria of learning tools based on PR-TKBMD are as follows:

Table 2 Level of Criteria Validity

Va or value of average total	Validity of Criteria
$1 \leq Va < 2$	Invalid
$2 \leq Va < 3$	Less Valid
$3 \leq Va < 4$	Valid Enough
$4 \leq Va < 5$	Valid
$Va = 5$	Very Valid

Source:(Sinaga, 2007) [24]

Annotation:

Va is the value of determining the level of prevalence and learning devices using PR-TKBMD.

Meanwhile, to calculate the validity and Ability of Understand Mathematical Concept test and self-regulated learning questionnaires used product moment correlation formula that is:

$$r_{xy} = \frac{n\sum XY - \left(\sum X\right)\left(\sum Y\right)}{\sqrt{\left\{n\sum X^2 - \left(\sum X\right)^2\right\}\left\{n\sum Y^2 - \left(\sum Y\right)^2\right\}}}$$ *(Arikunto, 2012)*[25]

Annotation:
X: Score item rxy: test validity coefficient
Y: The total score n: many respondents who took the test
Determining the royality coefficient of a form test description used the alpha formula as follows:

$$r_{11} = \left(\frac{n}{(n-1)}\right)\left(1 - \frac{\Sigma\sigma_i^2}{\sigma_i^2}\right)$$ *(Arikunto, 2012:122)*[26]

Keterangan: r_{11} : test reliability coefficient $\Sigma\sigma_i^2$: the number of variance scores per test item
n : number of test items σ_i^2 : total variance
Practicality of Learning Device Based on PR-TKBMD
The first of Analysis the practicality PR-TKBMD is to use the validation sheet, where all validators/experts stated that the PR-TKBMD device can be used with "minor revision" or "no revision". As for seeing the enforce ability of the device used PR-TKBMD observation sheet improvement learning device. Criteria improvement learning device is as follows:
Very Low, If $0 \leq P < 1$
Low, If $1 \leq P < 2$
Enough, If $2 \leq P < 3$
High, If $3 \leq P < 4$
Very High, If $4 \leq P \leq 5$
Annotation:
P is the average score
PR-TKBMD device is said to be practical or easy to implement if the enforce ability of the PR-TKBMD are in the category of high minimal.

Effectiveness of Learning Devices Based on PR-TKBMD
Complete Classical Ability of Understand Mathematical Concepts
The effectiveness of PR-TKBMD is based on student achievement in classical mastery learning. The criteria that states that students have been able to represent mathematically if there are 75% of students who follow the ability understand mathematical concept with a minimum value of 75. Percentage can be calculated by the formula:
Percentage of Agreement (R) = $\frac{Agreements\ \ (A)}{Disagreements\ \ (D)+Agreements\ \ (A)} x100\%$

Teacher's Ability to Manage Learning
The activity of the teacher to manage the learning process is the ability to develop a familiar and positive learning atmosphere. The activity of determining the average score of the total aspects of the assessment of teachers' ability to manage learning adapts the steps Hobri developed by Suryaningsih [27] in 2014, with the following criteria:
Criteria:
Since the range of these scores is 0 to 5, the length of the interval within this score range is 5. To make the criteria of the effectiveness of the teacher's ability to manage the learning, this interval is subdivided into 5 sub equal intervals:
Very low, if $0 \leq \bar{P} < 1$
Low, if $1 \leq \bar{P} < 2$
Simply, if $2 \leq \bar{P} < 3$
High, if $3 \leq \bar{P} < 4$
Very High, if $4 \leq \bar{P} \leq 5$

Student Response
Questionnaire responses of students were analyzed by calculating the percentage of many students who responded positively to each of the categories asked in the questionnaire by using the following formula:

$$PRS = \frac{\sum A}{\sum B} \text{ x } 100\% \quad \text{Trianto [28] in 2011}$$

Information :
PRS: Percentage of many students who respond positively to each of the categories asked
ΣA: Proportion of students who choose
ΣB: Number of students (respondents)
The criteria are set to say that students have a positive response to learning tools developed when the number of students who responded positively was greater than or equal to 80% of the many subjects studied for each trial by Sinaga [29] in 2007.

Improved The Ability to Understand Mathematical Concepts
To calculate the improvement of students' mathematical understanding ability after using mathematical learning devices developed based on realistic approach integrated with Malay Deli cultural context (PR-TKBMD), determined by gain formula, that is:

$$gain = \frac{Postest\ Value - \Pr etest\ Value}{Ideal\ Value - \Pr etest\ Value}$$ Hake [30] in1999

With the following criteria:

Table 3 Gain value Category

Gain Value	Category
$gain < 0{,}3$	Low
$0{,}3 \le gain \le 0{,}7$	Middle
$gain > 0{,}7$	High

Improvement of Students' Self-Regulated Learning
To find out the scale of student's self regulated learning based on scores obtained students can use criteria that refer to the opinion of Prastini & Retnowati [31] in 2014 as follows:

Table 4 Level of Mastery of Student Learning Independence

No	Conversion Value		Category
	Value	Alphabet	
1	76-100	A	Very Good
2	51-75	B	Good
3	26-50	C	Enough
4	0-25	D	Not good

IV. Research Result

1. Validity, Practicality, and Effectiveness of Learning Devices
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 validators. The validation results of teaching materials developed by 5 validators are valid and can be used with "small revisions". Validation results by 5 validators are presented in the following table.

Table 5 Summary of Results Validation Learning Device

No	Device developed	The average value of total validity	Category
1.	Learning Implementation Plan	4.4	Valid
2.	Student Activity Sheet	4.6	Valid
4.	Teacher Book	4.6	Valid
3.	Student Book	4.4	Valid

Then the mathematical concept comprehension test instrument and self-learning questionnaire 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 concepts 0.672 (very high category) and posttest the ability of understanding mathematical concepts of 0.643 (very high category), as well as the reliability of self-study questionnaire questionnaire of 0.872 (very high category). After fulfilling the criteria of validity and have made a small revision, the next teaching materials in the form of draft II will be tested in this study on the students of grade VII-1 SMP Negeri 5 Medan. The results of research on learning tools developed otherwise valid, practical, and effective. The results of this study are:

Tests I

Practicality

Learning devices based on PR-TKBMD developed are said to be practically reviewed from two indicators. Firstly, the expert assessment / practitioner of the developed learning devices can be used with little or no revision. The obtained analysis states that the PR-TKBMD-based learning devices can be developed generally well and can be used with little revision. This assessment is given to the experts / practitioners at the same time with the provision of validation of the learning device. And secondly, the observation result of the learning device in the classroom is included in the high minimum category ($3 \leqslant P < 4$). The results of the learning device implementation analysis are presented in the following table.

Table 6 Recapitulation of Observation Results of Implementation of Learning Trial Tool I

No.	Aspects Observed and Assessed	Meeting			Average
		1	2	3	
1.	Learning Implementation Plan (RPP)	3,50	3,63	3,75	3,63
2.	Student's Worksheet Implementation (LAS)	3,63	3,88	4,25	3,92
3.	Teacher's Book (BG) and Student's Book (BS)	3,50	3,88	4,00	3,79
Average of Implementation		3,54	3,79	4,00	
Average of Implementation Trial I		3,78			

Effectiveness

Learning devices based on PR-TKBMD developed are said to be effective in terms of students' learning completeness classically, that is at least 75% of students who follow the learning can achieve the score ≥75, 80% of students respond positively to the learning device components developed, and the ability of teachers to manage the minimal learning pretty good. All of these criteria can be seen in the following description:

Complete Classical Ability to Understand Mathematical Concepts

Overall, the results of analysis of test data I against learning tools developed have not met all the specified effectiveness criteria, because there are still indicators of effectiveness that have not been met. The posttest result of the ability to comprehend mathematical concepts does not meet the criteria for the achievement of students' learning achievement in a classical manner, as presented in the following table.

Tabel 7 The level of Completeness Classical Ability to Understand Mathematical Concepts Trial I

Category	**Ability to Understand Mathematical Concepts**	
	The Number of Students	**Percentage**
Complete	22	64,71%
In-complate	12	35,29%
Sum	34	100%

Teacher's Ability to Manage Learning

The following will briefly describe the value of teachers' ability to manage learning using PR-TKBMD for two meetings:

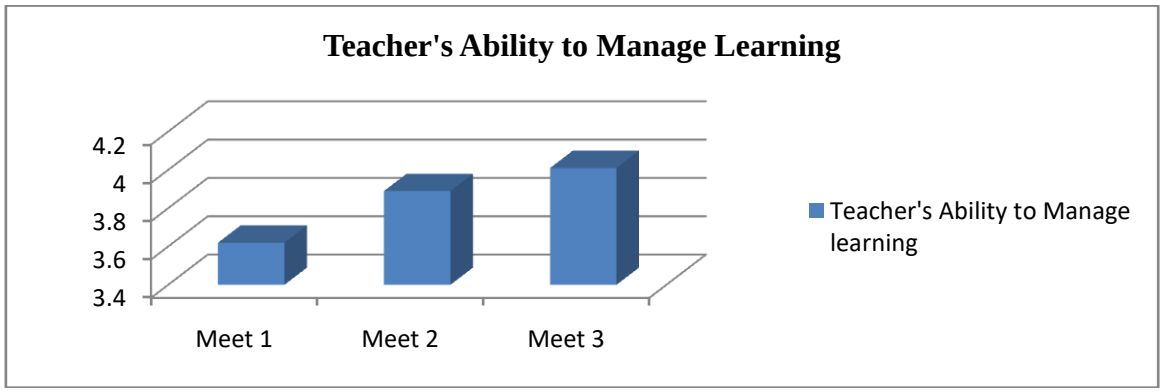

Figure 1: Graph of Teacher's Ability to Manage Learning Trial I

At meeting 1, the teacher's ability to manage learning 3.62 in the high category. While at meeting 2, the teacher's ability to manage learning 3.89 on high category, and at meeting 3, the value of teacher ability to manage learning 4.01. This shows that the average value in implementing classroom learning using PR-

TKBMD is 3.84 in the high category.

Student Response

Based on data analysis result of learning result during 3 meetings of experiment I found that, the average percentage of student response in each meeting is positive. This means that students give a positive response to learning by using PR-TKBMD. The student response given in trial I has reached the high category of 90.02% This indicates that, learning using PR-TKBMD has met the effective criteria in terms of student response.

Tests II

Practicality

Learning devices based on PR-TKBMD developed are said to be practically reviewed from two indicators. Firstly, the expert assessment / practitioner of the developed learning device can be used with little or no revision. The obtained analysis states that the PR-TKBMD-based learning devices can be developed generally well and can be used with little revision. This assessment is given to the experts / practitioners at the same time with the provision of validation of the learning device. And secondly, the observation result of the learning device in the classroom is included in the high minimum category ($3 \leq P < 4$). The results of the learning device implementation analysis are presented in the following table.

Table 8 Recapitulation of Observation Result of Implementation of Learning Trial Tool II

No.	Aspects Observed and Assessed	Meeting			Average
		1	2	3	
1.	Learning Implementation Plan (RPP)	3,81	4,13	4,44	4,13
2.	Student's Worksheet Implementation (LAS)	3,75	4,00	4,25	4,00
3.	Teacher's Book (BG) and Student's Book (BS)	3,50	4,00	4,25	3,92
Average of Implementation		3,69	4,04	4,31	
Average of Implementation Trial II		4,01			

From the table above, it can be seen that the overall learning tool implementation for three meetings on trial II has an average learning device implementation of 4.01 which is in very high category.

Effectiveness

Learning devices based on PR-TKBMD developed are said to be effective in terms of students' learning completeness classically, that is at least 75% of students who follow the learning can achieve the score ≥75, 80% of students respond positively to the learning device components developed, and the ability of teachers to manage the minimal learning pretty good. All of these criteria can be seen in the following description:

Complete Classical Ability to Understand Mathematical Concepts Overall, the results of analysis of test data I against learning tools developed have not met all the specified effectiveness criteria, because there are still indicators of effectiveness that have not been met. The posttest result of the ability to comprehend mathematical concepts does not meet the criteria for the achievement of students' learning achievement in a classical manner, as presented in the following table.

Tabel 9 The level of Completeness Classical Ability to Understand Mathematical Concepts Trial II

Category	**Ability to Understand Mathematical Concepts**	
	The Number of Students	**Percentage**
Complete	28	82,35%
In-complate	6	17,65%
Sum	34	100%

Master's Ability to Manage Learning

The following will briefly describe the value of teachers' ability to manage learning using PR-TKBMD for two meetings:

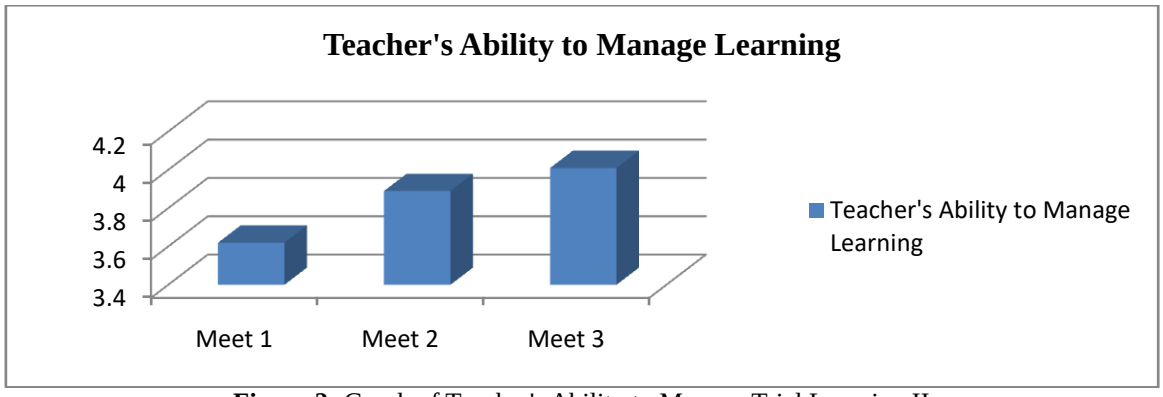

Figure 2: Graph of Teacher's Ability to Manage Trial Learning II

At meeting 1, the teacher's ability to manage learning 4,075 in the high category. While at meeting 2, the value of teacher ability to manage learning 4.12 in high category, and at meeting 3, value of teacher ability to manage learning 4.15. This shows that the average value in implementing classroom learning using PR-TKBMD is 4,115 in the high category.

Student Response

Based on the results of data analysis of learning outcomes during the 3 second trial meeting obtained that, the average percentage of student responses in each meeting is positive. This means that students give a positive response to learning by using PR-TKBMD. Student response given in trial II has reached high category that is 92,87% It shows that, learning by using PR-TKBMD have fulfilled effective criterion in terms of student response.

2. Improved Student's Ability to Understand Mathematical Concept

Description of improving students' understanding of mathematical concepts using learning devices developed based on PR-TKBMD on trial I and trial II can be seen in the following table.

Table 10. Description of Ability to Understand Mathematical Concepts Results

Explanation	Understand mathematical Concept Posttest	
	Trial I	Trial II
The highest score	91,67	97,22
Lowes rated	50	66,67
Average	76,96	80,63

Then, the improvement of students' mathematical concept of understanding ability was analyzed using N-gain. The increase that occurred in trial I and trial II can be seen in the table below.

Table 11. Description of Ability to Understand Mathematical Concepts Result

N-Gain	Interpretation	Ability to Understand Mathematical Concepts Trial I	Ability to Understand Mathematical Concepts Trial II
g > 07	High	1	3
0,3 < g ≤ 0,7	Middle	20	14
g ≤ 0,3	Low	13	17

3. Improvement of Student's Self-Regulated Learning

Student's self-regulated learning using learning devices developed increased when viewed from the average per indicator and average total self-regulated learning in trial I and trial II. The improvement can be seen in the following table.

Table 12. Description of Self-Regulated Learning Result

Self-Regulated Learning Aspect	Average Score per Indicator		Improvement per indicator
	Trial I	Trial II	
Learning Initiative	8,91	9,68	0,77
Diagnose Learning Needs	8,5	9,24	0,74
Organize and control the progress of learning	8,06	8,91	0,85
Setting the goals and objectives of learning	8,44	8,8	0,36
Viewing adversity as a challenge	9,62	10,5	0,88
Find and utilize relevant learning resources	8,09	8,7	0,61
Choosing and implementing learning strategies	9,59	11	1,41

Evaluate the learning process and outcomes	8,15	8,8	0,65
Self-concept	9,47	10,1	0,63
Average per Indicator	8,75	9,52	0,77

Furthermore, the achievement of learning independence can also be seen based on the categorization table of student learning independence presented in the following table.

Table 13. Categorization of Student Self-Regulated Learning

No	Conversion Value		Category	Students in Trial I	Students in Trial II
	Value	Alphabet			
1	76-100	A	Very Good	0	0
2	51-75	B	Good	31	34
3	26-50	C	Good Enough	3	0
4	0-25	D	Less Good	0	0

Based on the above table, it can be concluded that students' self-regulated learning after using the developed PR-TKBMD based learning devices increased from trial I to trial II.

V. Discussion

Based on the formulation of problems and research questions proposed in the previous section, then based on the data obtained from the test results 1 and 2 will be known whether the problem formulation and research questions raised have been answered or not. The results of data analysis obtained from test results 1 and 2 show: (1) learning tools based on PR-TKBMD developed valid, practical, and effective; (2) improvement of students 'mathematical concept and students' learning independence by using developed PR-TKBMD-based learning tools; and (3) the student's answer process indicates the categories either through the learning tools developed.

Based on the validation of learning tools based on PR-TKBMD, it was found that the learning tools based on PR-TKBMD namely Learning Implementation Plan (RPP), Teacher Book (BG), Student Book (BS), and Student Activity Sheet (LAS) were declared valid or have a good degree of validity. Furthermore, the validation of the ability to comprehend the concept of mathematical concepts and questionnaires of student's self regulated learning is also valid or have a good degree of validity. This shows the learning devices based on PR-TKBMD developed both RPP, BG, BS, LAS, the ability to comprehend mathematical concepts and the questionnaire of student self-regulated learning has met the criteria of validity.

The above is similar to the opinion of Ibrahim & Wahyuni [32] in 2012 that the validity of the content (Content Validity) is the accuracy of a measuring tool in terms of the contents of the measuring instrument. A measuring instrument is said to have the validity of the content if the content or materials or materials measuring tool is really a representative material to the given learning materials. That is, the contents of the measuring tool is estimated in accordance with what has been taught based on the curriculum.

According to Nieveen [33] in 2007, "Another characteristic of high-quality interventions is that end-users (for instance the teachers and learners) consider the intervention to be usable and that is easy for them to use the materials in a way that is largely compatible with the developers' intentions. If these conditions are met, we call these interventions practical, "which means that other criteria of quality instructional devices are users (teachers and students) can easily use the material in a way that is perfectly suited to the intent of the developer (who developed the learning device).

Based on the results of the expert assessment, learning device components developed in the form of Learning Implementation Plan (RPP), Teacher Book (BG), Student Book (BS), Student Activity Sheet (LAS), test the ability to comprehend mathematical concepts and questionnaire student self-reliance practical / can be used with small revisions.

Based on the result of posttest analysis of trial I and trial II it was found that, the ability of understanding mathematical concepts of students have fulfilled the criteria of classical completeness. This is because the material and the problems that exist in the student's book and activity sheet are developed in accordance with the condition of the student learning environment and refer to the learning tools based on PR-TKBMD.

This is reinforced by the views of Fauzan and Yerizon [34] in 2013 in learning by using the RME approach can improve students' learning mastery in learning, especially mathematical ability and student learning independence. One of the goals gained from the development of learning tools based on PR-TKBMD in this research is to improve students' mathematical concept. Using a realistic approach, the role of the teacher becomes very important as a facilitator, the teacher must be able to direct or help the students to determine what is known, what is needed to know and where they can seek important information so that students are able to understand what and why they should learn. The learning process using such a realistic approach positively impacts the development of the ability to comprehend mathematical concepts and helps students develop

intellectual discipline and skill needs to arouse curiosity and seek answers from curiosity.

Subsequently, the results of Minarni & Napitupulu [35] in 2016 studies show that, "Learning materials developed based on JPBL is effective to improve the students 'mathematical understanding skills and the students' responses towards learning materials are positive." Which means that the development of materials teach Joyful Problem Based Learning (JPBL) can improve the ability of mathematical understanding and generate positive response from users (teachers and students).

Based on the results of questionnaire data analysis student self-reliance in trial I and trial II showed that student learning independence increased (better). The increase of learning independence is seen from the average questionnaire results of student self-sufficiency per indicator, from the average of 8.75 increased to an average of 9.52. This is reinforced through the results of research conducted by Eliserio [36] in 2017 which shows that the learning of mathematics through guidance and individual learning strategies have a better effect on the achievement of student learning independence.

VI. Conclusion

Based on the results of analysis and discussion in this study, presented several conclusions as follows:
1. Learning tools developed based on Realistic Approach Integrated Context of Deli Malay Culture (PR-TKBMD) on fractional materials have met the valid, practical, and effective categories used to improve the comprehension ability of mathematical concepts and student learning independence.
2. Improvement of students 'understanding of mathematical concepts Learning tools developed based on Realistic Approach Integrated Deli Cultural Context Context (PR-TKBMD) on fractional materials is the average gain of students' mathematical understanding ability in experiment I of 0.25 increased to 0, 33 in trial II.
3. Increasing students' learning independence using learning tools developed based on Realistic Approach Integrated Context of Deli Malay Culture (PR-TKBMD) on fractional materials is the average achievement of student learning independence on trial I of 65.69 increased to 71.37 on the test try II. In addition, the average of each student self-efficacy indicator increased from trial I to trial II.

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