STATISTICS IN ELEMENTARY SCHOOL FOR SOCIETY 5.0

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ABSTRACT

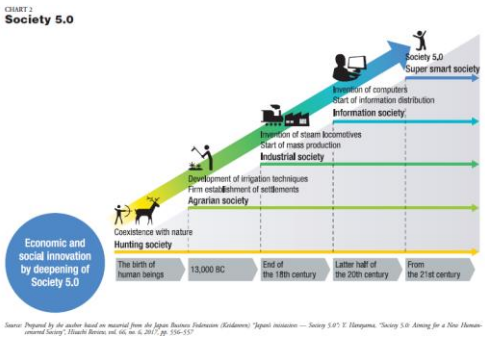
The aim of this study is development teacher books, student books, and LIT Valid, practice, and Efective . Methods This study use the development research of Plomp and Grameijer. This population is N = 249. Based on the analysis of data using ANOVA test α> Sig, then the mathematics problem solving ability of students to use teaching materials RME higher than conventional. As in this study resulted in three products namely student books, teacher books, and Local Instructional Theory (LIT).The result of research is made Book student, teacher books and LIT is Valid, Efective, and Practice. Problem solving mathematics is more important to impove To solve problem society 5.0.

Keywords: *LIT, RME, Statistics*

PRELIMINARY

Mathematics is one of the important lessons learned in elementary school. The main purpose of learning mathematics in school is that the students are able to develop mathematical ability to solve problems in everyday life. According to National Council Of Teachers Of Mathematics (2000) standards and benchmarks proposed mathematical learning is problem-solving abilities, reasoning and proof, communication, connections and representation.

Skills in mathematical problem solving in Indonesia is to be implemented, it is supported also by applied Permendiknas 22 (The game, 2006), It is also supported Hoogland, Pepin, Bakker, Koning & Gravemeijer, (2016)by express primary purpose of education is to foster Traffic mathematics students to use their knowledge and abilities to solving the problems of everyday life. According to(OECD, 2018) suggests the main purpose of education is not just a set of knowledge, abilities, skills but also they can use in everyday life.



Picture 1. Developing Society 5.0

(Fukuyama, 2018) It is the goal of Society 5.0 to create a human-centric society in which both economic development and the resolution of societal challenges are achieved, and people can enjoy a high quality of life that is fully active and comfortable. (Ferreira & Serpa, 2018) Society 5.0 is to strive for a new, human-centered society, at the same time resolving a variety of societal issues. In order for the implementation of Society 5.0 not to be a sheer political-ideological concept, it seems that there is the need to integrate several dimensions, such as: "1) Innovation Policy (from government side), 2) Entrepreneurial spirit (from Society Side) and 3) Entrepreneurial Skills (from civil society and institutions)". So problem solving mathematics is more important to impove. To solve problem society 5.0.

Some of the results of previous studies, it was found that the students had trouble against the topic Statistics, According to Jacobbe & Horton, (2010)suggested for students in grade 3-5 (9-11) mengelami problems in such statistics, it is difficult classifying the data, it is difficult to know the information contained in the data, and it is difficult to compare the data with the other data. It is also supported by(Hayat, 2014)proposed Guidelines for Assessment and Instruction in Statistics Education (GAISE) Report on the stage of thinking level A (ages 5-11) will be described teaching students to develop their data variation Traffic think assimilation and distribution. It is also supported by(Franklin & Mewborn, 2008) memperlajaran statistics in primary school has diataranya scenario, the formulation of the question with the data, collect data, analyze data, and interpret the data.

Statistical learning done in school merely reading the data presented. Which raised the problems encountered on the results of previous studies, also found from the results of preliminary studies that have been done. Only 50.5% of students were able to answer correctly to 5 questions given. Difficulties experienced by students is that students do not understand the problems given and students are not able to resolve the given problem with statistics (49.5% of students). Results of interviews with teachers also found that learning is done by listening to the teacher's explanations of each step of statistical learning. Then the students were given several questions in the textbook, then mentions the data that the highest and lowest of data only,

The problems encountered, the learning-based realistic mathematics education can be an alternative solution. This is evidenced by several studies that have been carried out by previous investigators, such as(Mcgatha & Cobb, 2016)Headlines An Analysis of Statistical stundent Understanding was able to create a statistical learning process interesting and meaningful learning. Then Walle (2013) titles of books and Mindle Elementary School Mathematics Teaching Development.

RME is an approach in mathematics was first born in the Netherlands. RME is defined as an approach to math education that teaches math concepts by the student experience so that it becomes steady and meaningful (Fauzan & Sari, 2017, p. B55). In designing the RME-based learning, a teacher needs to pay attention to the main principles of RME to achieve the desired goal. Gravemeijer (Fauzan, 2002, pp. 35-43) describes the three main principles that must be understood RME, which is guided reinvention through progressive mathematization, didactical phenomenology, and self-developed models or emergent models.

Based on the main principles of RME, through this research, a Local Instructional Theory (LIT) Statistics based RME for topics in basic kelasIVsekolah. LIT is a theory of the learning process for a particular topic with activities that support (Gravemeijer & Eerde, 2009, p. 512). The topics related to Statistics. The LIT developed such that by observing the principles of RME, so that students are able to construct their own knowledge through the activities contained therein. An early form of the products developed are hypotetical 'Learning Trajectory (HLT). This is in accordance with the statement Prahmana (2017, p. 21) that LIT is the end product of the HLT that have been designed, diimpelementasikan, and analyzed the results of learning.

HLT is an activity undertaken by imagining how a teacher and the students' way of thinking on the learning activities involved. The activities listed on HLT components, as disclosed Simon (1995, p. 136), which is the purpose of student learning, and learning activities that will be experienced by students, and the hypothesis of the students during the learning process. Learning objectives related to the specific objectives of the topics to be covered. Learning activities related to the activity contextual solve the problem based on the principles of RME. In addition, the hypothesis associated with the prediction of teachers on students' thinking in solving a given problem, so the teachers were also included in anticipation of the predictions appear to achieve the expected goals. Based on these findings,

METHOD

The method used is research development (developmental research approach). Development model used is the type of research design Gravemeijer & Cobb (2013). There are three phases, namely preparing for the experiment, experimenting in the classroom, and conducting retrospective analyzes. This design is used in developing the Local Instruction Theory (LIT) to the initial shape in the form of HLT. The event begins with a thought experiment that is thinking of learning to be

traversed groove students, and then to reflect on the results of experiments conducted. If the objectives have not been achieved, then the thought experiment and experiment instruction following the same material, so that LIT guiding thought experiment and experiment instruction. In the long-term period, the relationship was depicted as Figure 1. HLT has been made, then designed the student book and teacher books are based on activities of the HLT. This study was conducted in two laboratories elementary school that the UNP and SDN 19 Air Tawar. Subjects of this study is to test the students grade 4 .

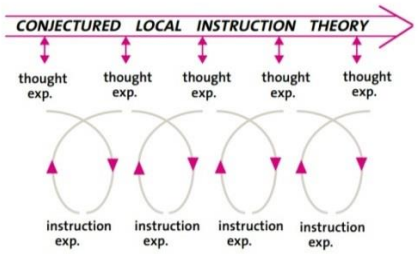


Figure 2. Relationship between theory and experiment reflection (Gravemeijer & Cobb, 2013, p. 85)

Phase preparing for the experiment

In this phase, the goal is to design products that are to be gained, the HLT, student books and teacher books. Various activities are carried out in this phase, namely the analysis of the needs and context, a review of the literature, product design, and formative evaluation. Analysts needs and context by analyzing the curriculum, concept, students, and the environment. Literature review conducted by reviewing the literature on RME and Statistics. The results serve as guidelines for designing products. Meanwhile, the formative evaluation is to do self evaluation and expert reviews. Self-evaluations done by reviewing typing errors, appropriateness of the contents, and the attractiveness of the product before it is given to the validator on the expert review. Expert review was done by a discussion with the validator content, language, and graphics to the products are designed.

Phase experimenting in the Classroom

Activities undertaken in this phase is the implementation of the products that have been validated by a validator as a continuation of the formative evaluation stage, the small group, and a field test.

Products implemented to the three people who are selected based on the ability of low, medium and high this phase is called with one to one. Further followed by Small group consisting of three small groups of students consisting of 5-10 people to evaluate praktikalitasnya. The small group is divided into lower ability group, group-skilled and high ability groups. Grouping is based on interviews with teachers. During the learning process conducted by HLT and teachers guide students learning activities using students' books. Furthermore, the learning activities that have occurred analyzed by looking at the achievement of a product, as well as determine the practicalities, the HLT that have been designed, such as destination, activity, prediction and anticipation of the learning process.

field test as well as efforts to determine the practicalities of effectiveness. Practicalities determined by giving questionnaires to students and fill the observation sheet, as well as field notes. Meanwhile, the effectiveness was conducted to determine the effect or impact of a given LIT Activities focused on the assessment of the tests are given at the last meeting to determine whether the LIT designed to give effect to the students' problem-solving abilities.

Conducting Phase Retrospective Analyzes

This phase is the phase in conjunction with experimenting in the classroom. This phase is very important role in trial activity for small group and field test. This phase aims to reflect the implementation of the executed. When HLT lack of achievement, the teacher reflects shortcomings during implementation. Teachers can determine the probing question that can guide students to solve the problems given. After doing repairs would weaknesses were identified, the teachers implement these improvements back to the desired goal is achieved. In the end, HLT has been

implemented until the end of the meeting conducted field test and repair, become a local product called instructional theory (LIT).

The selection of research subjects conducted on 10 primary area of Padang District IV North has KKM 75. Selection of the subject of research conducted with the following activities:

Collecting value midterms fourth grade math student IV region Padang Utara subdistrict academic year 2018/2019

1. Prerequisite test analysis
   a. Normality

      Average similarity test performed by the test for normality. Normality test aims to determine the sample group distributed population derived from normal or abnormal. In this case using Kolmogorov Smirnov test. This is due to the requirements of the test kolmogorof is a single data and kolmogorof Smirnov test can be used n large and small

      The samples from normally distributed population is when calculated as a maximum of <Dtabel with α = 0:05.

Table 1. Normality Test Value Mid Semester Mathematics SDN Region IV North Padang District School Year 2018/2019

No.	School name	N	Dtabel (α = 0,05)	Ket
1.	SDN 19 Air Tawar Barat	18	0309	Normal
2.	SDN 05 Air Tawar Barat	16	0327	Normal
3.	SDN 09 Air Tawar Barat	26	0259	Normal
4.	SD Buah Hati	28	0250	Normal
5.	SD Labotorium UNP	29	0246	Normal
6.	SD Angkasa 1	29	0246	Normal
7.	SD Angkasa 2	25	0264	Normal
8.	SD Angkasa 16	26	0259	Normal
9.	SD Angkasa 26	28	0250	Normal
10.	SD Angkasa 28	28	0250	Normal

   b. Homogeneity test

      Average similarity test performed by the homogeneity test on page 391. Wipole book Homogeneity test aims to see whether the samples come from a homogeneous population or not. Homogeneity test performed using the Bartlett test. Samples derived from a homogeneous population can be determined if b count <b table with α = 0:05. The test results are b count homogeneity is 0.000327 and b table is 0.031318. So btabel> b arithmetic, then kesimpulanya is Ho accepted

H1 = ten varieties are not all the same (not homogeneous)
H0 = ten varieties are all the same (homogeneous)

Based on the test results it can be concluded under the ten Barlett the data is the same (homogeneous)

Random sampling (sample random sampling). Schools are drawn are: SD Laboratory testing UNP as a class one to one, small group and fiedtest as the class that determines the effectiveness of the practicalities and time field test

2. Hypothesis testing

Test the hypothesis of this study is to use one-way ANOVA test (Paired test)

$H_{0:}$ student mathematics problem solving using RME no higher than conventional

$H_{1:}$ student mathematics problem solving using RME higher than conventional

RESULTS AND DISCUSSION

Phase preparing for the experiment

The results of the curriculum analysis found that Statistics that learned in grade IV is conducting an analysis of teacher and student books book in circulation, and KD were used in pembelajaran.Terdapat pengembanan in the indicator, into understanding the data, collecting data, presenting data, and read data. In this case, the expected achievement is students are able to use the statistics in solving the problems found in the everyday. Then, the results of the analysis of students

found that students fourth grade UNP Laboratory as a research subject has a liking for LKPD red, blue and yellow. Meanwhile, the results of the environmental analysis found that most parents work as traders, customs provided by the school as a regular program is an additional dining, eating fruits together,

The results of the literature review found that learning RME RME very attentive to three main principles, namely the reinvention guided through progressive mathematization, didactical phenomenology, and self-developed models or emergent models.

At the reinvention principle, students are given the opportunity to undergo a process resembling invented mathematics. With regard to this principle, the learning path must be mapped to allow students to discover math target itself. Then, didactical Phenomenology related to instructional development that should give students contextual issues drawn from real and meaningful phenomena. Meanwhile, self-developed models play an important role in bridging the knowledge gap between informal and formal knowledge.

The learning process involves horizontal and vertical mathematization mathematization. Students have the opportunity to solve contextual problems by using informal language as horizontal mathematization. Once students experience a similar process in some time, informal language evolved into a more formal or standard language. In the end, students are able to use mathematical algorithms. This is called a vertical mathematization. In this case, the horizontal and vertical mathematization mathematization depicted in 4 learning objectives to be achieved, the student can find the sense of the data, able to collect the data, is able to present the data, and is able to read the data as Figure 2.

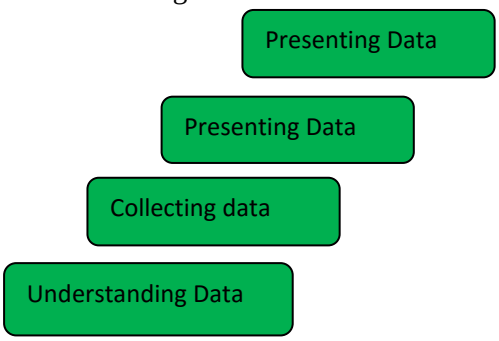


Figure 3. Flow Grade Students Learn Statistics Basic IVSekolah

Four goals achieved by students until the students were able to find and use Statistics conducted a series of ongoing activities. The activity of each meeting begins with providing the problems contextual regarding the matter earlier, explaining the purpose of learning, divide students into small groups, menanyangkan problems of contextual, do questions and answers, discussions to resolve the problems found in LKPD, responding to settle matters by other groups, discuss and conduct the evaluation.

The products have been designed and conducted self evaluation, followed by validation of the three experts, namely validator content, language validators, and validators graphics to produce valid. Results validator contents of that product in general has a value of B with a little improvement. As for the make up and the alleged problem is the use of student activity. Later, language validators also give the value of B on the product. Advice given is the use of the font, font size, and the suitability of the sentence. Meanwhile, the product graphically is B. The advice given is the suitability of the paper size and image clarity.

Phase experimenting in the Classroom and Phase Conducting Retrospective Analyzes

The products have been valid, followed by testing in small group and field test. The pilot phase of a small group of students performed at 9 Laboratory UNP fourth grade. Tests conducted outside of instructional hours. The trial started on February 11, 12 those in February, February 13, February 21, February 22, February 25, da February 26th. The results are found, for 4 meetings for one to one and 4 meeting for Small group phase there is some form of answers written by the students.



Figure 4 The process of implementation of phase one to one

On the first day, students are expected to understand the concept of data. With 2 given activity, there are horizontal mathematization to be vertical mathematization. It is found from the shape of the answers written by the students, although there are still some students who do not understand the meaning of data. However, the students' answers on the activity 1 and activity 2 has a shape or pattern of different answers. In the first activity, students presented an information data contained three varieties, but the activity of two students presented an information data contained 5 kinds,

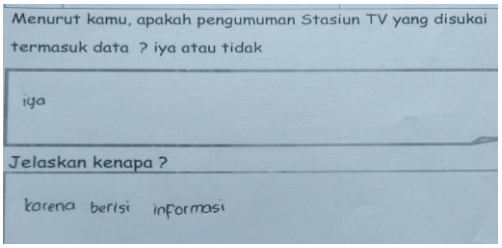


Figure 5. Answer Student LKPD 1

On the second day, students are expected to define a strategy for data collection consisted of interviews, observations and questionnaires. In this case, the concept of settlement that has been used previously to a horizontal mathematization students to complete the activity 1 and activity 2 LKPD 2 .. Based on the answers found in one activity, students have determined the strategy for collecting data defined problem, however there are still students who not able to determine a strategy in menyelesain problem collecting data.

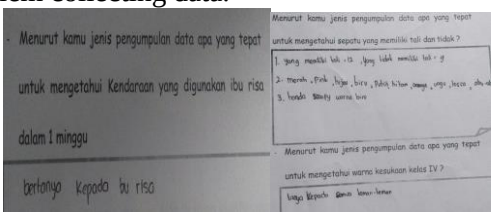


Figure 6

On the third day, students are expected to solve problems by using the contextual Statistics presents data that has been collected in the previous meeting. The results of the two activities given that the student is able to manyajikan data. It found the first activity is many students choose data presentation with charts. While the second activity, students prefer bar charts than other forms because it is often encountered in everyday life.

On the fourth day, a learning experience before a provision for students to reach the top of the groove study conducted, which reads the data on the activity of one, the students presented the data and then the students read what information is contained in the data, students find information about the data the most high, Data Paing low and compare data. While the second activity, some students simply specify the data that the highest and lowest, and compare the data.

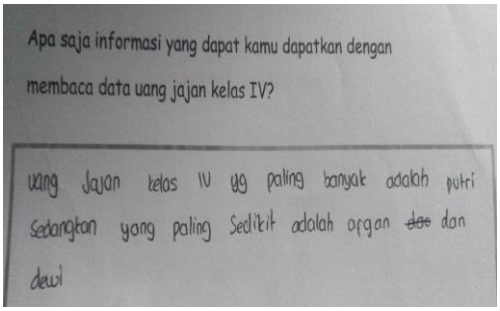


Figure 7

Results found in the small group trial be a material improvement to the implementation of the test product on the actual class. Various improvements were made, namely the prediction of problem-solving activities to be undertaken students and the anticipation will be done through a probing question.

Day 1. understanding Data

During the first activity in the student book, there is a student who was silent and did not understand was done to solve them. When the teacher gives the students questions, such as the conversation below. That question is in anticipation of pre-prepared teachers to guide students during the learning activities

Teacher: *Do you understand the problems that occur in a given problem?*
Student : *No sir?*
Teacher: *Already*
Teacher: *Try to repeat the question, and what is out of the question?*
Student : *Already teacher the question of whether this information includes data.*
Teacher: *So, according to you whether the above information, including data.?*

It is appropriate According to (Ryan, nd: 2007) revealed that there are some statistical problems occurred in 4-15 year-old students are: misreading, miscomprehension (missing meaning of the task), transformation errors, incorrect processing, and incorrect encoding.

Day 2 Collecting Data

On the second day, there are two activities that dilesesaikan students. The final result expected is that students can mnggunakan Statistics contextual ten to resolve issues concerning Statistics. The tools used to help students solve problems is counterfeit. However, on that day, the student chooses not to use the tools provided to solve the problems.

In the first activity, students determine the appropriate strategies in collecting data. At 2 LKPD activities, students were beginning to collect data, there are three techniques to collect data of the student is asked, mewaancarai, and observation to collect data.



Picture 8: Event Data Collection with shoes that have a rope separating the DAA does not have a rope

Day 3. Presenting Data

On the third day, the students are expected to present data that has been collected at the meeting sebelumnya.untuk support the achievement of learning goals for meeting HLT researchers designed three who adjusted to the results of research (Cobb & McClain, 2003), (Cobb & McClain, 2003) and (Franklin & Mewborn, 2008) as follows :

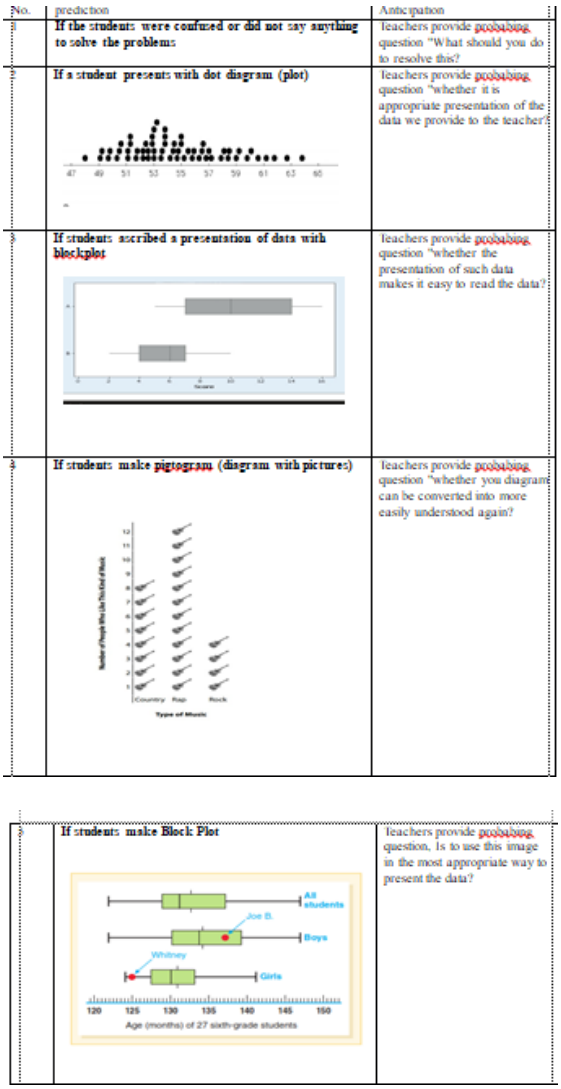


Figure 9 LIT for Presenting of Data

Day 4. reading Data

Students read the data that has been presented, .siswa read data and write the data information acquired as the most high, most of tranquility and comparing the data.

Based on the activities and findings of the students 'answers, can be described shape change students' answers are beginning to know the sense of data, followed by data collection, presentation and reading of data. The main results of this study indicate that through the activity of solving the problems in each groove contextual learning, students can use the statistics in solving the problems of everyday life ,. RME with three main principles on which to base learning, learning practicalities conducted showed very practical criteria with a value of 85%. Meanwhile, the effectiveness of the product a positive impact on students' problem-solving abilities. It is seen from the results of the evaluation of each end of the meeting that showed 85% of students have problem solving skills with the criteria very well.

DISCUSSION

The test results refer to the posttest. The test results related to the students' mathematical problem solving ability. Comparisons are made between students who are given learning by PMR (experimental group) and conventional learning (control group). In this case, the experimental class is fourth grade student Laboratory of the UNP and the control class is fourth grade students 19 Freshwater.

Based on the test results given problem-solving ability, there are differences in mathematical problem solving ability graders graders experiment with the controls. Results showed that the

experimental class capability 85% (very effective), while the control class capability 75% (quite effectively). This is consistent with the statement Gravemeijer (Fauzan, 2002, p.38) that there are advantages to solve problems using RME.

ANOVA

Skor Jawaban Soal PK

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	97.156	4	24.289	16.793	.000
Within Groups	122.944	85	1.446		
Total	220.100	89			

Figure 10 : Result Of Anova One Way

The results of statistical tests performed on the two classes of data showed that H1 is accepted (α> sig). This means that the mathematics problem solving ability of students to use LIT higher than conventionally taught. This is certainly in line with research conducted by Armanto (2002) that the contextual problem-solving ability of students better than conventional approaches by using LIT Fauzan (2002) that the experimental class student achievement is significantly higher than on the achievement of students who have been taught by conventional approach.

CONCLUSION

Based on the results, it can be concluded that the students' problem solving skills using the experimental group obtained RME class average value of 85%, while the students problem solving skills with the conventional learning control group gained an average value of 76 % grade. The results of statistical tests performed on the two classes of data showed that H1 is accepted (α> Sigl). This means that the mathematics problem solving ability of students to use RME approach higher than conventionally taught. This is certainly in line with research Fauzan (2002) that the experimental class student achievement is significantly higher than on the achievement of students who have been taught by conventional approach.

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