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Development of Students Work Sheet Based on Realistic Mathematic Approach with Ethnomatematic nuanced to Improve Critical Thinking of 4th Grade Students in Primary School (SD Negeri 091358 Haranggaol, Haranggaol Horisan Sub-District)

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Abstract

This study aims to develop students' worksheets based on a realistic mathematical approach with Ethnomatematic named on rounding numbers in 4th grade of primary school (SD Negeri 091358 Haranggaol, Haranggaol Horisan Sub-District). The object of this research is the Student Worksheet based on Realistic Mathematics Approach in Ethnomatematic nuance. The instrument used in this study was the mathematics learning achievement test and student response questionnaire. Data were collected and analyzed with quantitative descriptive analysis techniques. This research method is Borg & Gall development research combined with Dick & Carey's learning development model. The test subjects consisted of material and design learning experts, two linguists, using trial I and trial II. The results showed (1) The results of the expert test of subject matter on the assessment of the appropriateness of the content and the feasibility of the presentation were in very good criteria (85.42%); (2) The results of the learning design expert test were in very good criteria (94.23%); (3) Linguists' test results are in very good criteria (94.44%); (4) The results of trial I are in good criteria (60%); (5) The results of trial II are in very good criteria (90%).

Keywords
Student Worksheet,
Realistic Mathematics Approach,

I. Introduction

Primary School / Madrasah Ibtidaiyah (SD / MI) is the initial basic education before entering Junior High School / Madrasah Tsanawiyah (SMP / MTs). Education in Elementary Schools or Madrasah Ibtidaiyah is emphasized on the formation of the personality and mentality of students (Prastowo, 2013: 14). Considering the importance of basic education in SD / MI, the government always strives to improve the quality and relevance of basic education through: curriculum development, improvement of teacher professional abilities, development of quality and excellence in basic education, and development of teaching facilities and materials. To follow up on the relevance of education, the government intensively reforms the curriculum and procures relevant textbooks used in schools. This is because books are inseparable in the learning cycle. Without books a learning will be lame. The more supporting books, the more interesting learning will be. This is no different in the case of elementary school children who are still in the concrete development stage, namely having to use interesting and contextual learning media, both in appearance and in content.

Therefore, it must use learning media that are as attractive as possible, especially the teaching materials used. Teaching materials are materials or subject matter that are arranged systematically, which are used by teachers and students in the learning process. Teaching materials used can be in the form of Student Worksheet. It is a printed material in the form of paper sheets containing material, summaries, and instructions for implementing learning tasks that must be done by students, which refers to the basic competencies that must be achieved (Andi, 2011: 204). By providing contextual teaching that can help students make learning easier, in line with that Trianto (2010: 104) explains that contextual learning can help students relate the material they learn to the real situation of students and encourage students to make connections between the knowledge they have with their application in their lives as family and community members. Furthermore Sagala (2013: 87) revealed that children's learning will be more meaningful if the child experiences what he is learning, not knowing it. Target-oriented learning mastery of material proved successful in the remembering competency in the short term, but failed to equip children to solve problems in the long run.

Based on observations in 4th grade of Primary School in SD 091358, Harangaol Horisan Sub-District, Simalungun Regency, researchers observed the results of the pretest of the students with rounding numbers, which were 5 questions. From some of the questions it turns out that many students do not understand the concept of length measurement and weight measurement as well as the unit, rounding rules. In addition, the learning outcomes obtained from the pretest questions turned out to be under Minimum Mastery Criteria. The number of students implementing the pretest was 42 people (23 women, 19 men) and only 5 students whose grades were in accordance with Minimum Mastery Criteria score (score 71). There are 37 students who score below Minimum Mastery Criteria.

Mathematics learning presented using Student Worksheets requires active participation from students, because the Student Worksheets are a form of teacher effort to guide students structured through activities that are able to attract students to learn mathematics. In addition, learning with Student Worksheets can make the learning process more effective as expected in each learning that is increasing the creativity of students' thinking so that learning objectives are achieved.

In the era of the industrial revolution 4.0, learning emphasizes how students can understand concepts by observing real problems, process them with critical thinking, and gain experience. These three formulas, deliver students to be ready to face the era of the industrial revolution 4.0 which is expected that students can think high level is often called HOTS (high order thingking skills). Through the process of thinking in the daily experience, students are led to learning activities expected by the 2013 curriculum, especially in learning mathematics. In learning mathematics the model that is in accordance with the philosophy of constructivism and contextual is Realistic Mathematical Approach.

The Realistic Mathematics learning approach is known that this approach has been successful in Netherland. There are promising results from studies that have shown that in the Realistic Mathematics Approach students have a higher score compared to students who did not obtain the approach. Realistic mathematics has two philosophies, first Mathematics must be close to children and relevant to everyday life situations. However, the word "realistic" refers not only to connections with the real world, but also to referring to real problem situations in students' minds. Through the philosophy of the Realistic Mathematics Approach it is clear that the Realistic Mathematics Approach is one of the learning approaches that is in accordance with the desired Mathematics learning. So, by involving daily activities in learning mathematics in the classroom it will clearly make learning more meaningful, the

interaction between the teacher and students will be well established because students will be more active and the teacher only focuses as a facilitator in the learning process.

II. Review of Literature

2.1 The Nature of Learning

Learning is the most important thing that humans must do to deal with environmental changes that are constantly changing all the time. Shah (2011: 68) argues that in general learning can be understood as a stage of change in the behavior of individuals that are relatively settled as a result of experiences and interactions with the environment involving cognitive processes. Learning is a process of change from behavior as a result of interaction with the environment in meeting their needs with characteristics: (1) change occurs consciously; (2) changes in learning occur in a continuous and functional manner; (3) changes in learning are positive and active meaning that the changes are always increasing and aimed at getting something better than before; (4) changes in learning are not temporary, but are permanent; (5) changes in purposeful and directed learning; (6) changes in learning include all aspects of behavior (Suryabrata, 2011: 233).

2.2 The Nature of Social Studies Learning

According to Taufik (2012: 2) that active, innovative, and fun mathematics learning for students is something that really needs to be done in the process of learning mathematics. However, the success of students in learning mathematics, is not only determined by students' interest in the way teachers teach but can also be determined by the way the teacher packs the learning device, because the learning device functions to guide the process of implementing learning in achieving the goals of mathematics learning (Yustianingsih, 2017: 261).

Mathematics is an educational tool used to convey concepts so that humans more easily solve problems. By learning mathematics, humans increasingly know how to provide opportunities to develop good mindsets, increase self-confidence, beautify and improve the quality of life values, sharpen objective attitudes and be open to the times. Mathematics is generally formed from human experience in an empirical world. Then the experience is processed in the world of ratios, processed analytically by reasoning in the cognitive structure so that mathematical concepts are formed so that these concepts are easily understood by others and can be manipulated appropriately, so use mathematical language or mathematical notation of global value (universal).

2.3 Realistic Mathematical Approach

Realistic Mathematics Learning is a realistic mathematical approach developed in the Netherlands under Realistic Mathematics Education which means realistic mathematics education. Realistic mathematics learning is basically the use of reality and the environment experienced by students to expedite the process of learning mathematics, so as to achieve the goals of mathematics education better than before.

Realistic Mathematics Approach is learning that utilizes contextual problems and concrete objects so that through the approach in the learning process students will be guided to solve problems by giving problems related to real life. This approach reflects the principle that students must be given the opportunity to build their own knowledge and understanding.

When students build their own understanding through the opportunities that are given, it will make them from not knowing to knowing. The process that changes students from not knowing to knowing is the core of learning activities. Learning mathematics is identical with thinking activities. If someone is studying mathematics then he will do the thought process.

During the thought process takes place students are thoroughly trained to empower and activate the skills they have, so they can understand and master what they do.

According to Gravemeijer in Marlinda (2018: 79) suggests three main principles in PMR, namely: "guided reinvention and progressive mathematizing, didactical phenomenology and self-development models". Next Treffers in Marlinda (2018: 79) formulated five PMR characteristics, namely: (1) the use of "real" contexts for students, (2) the use of models to help students achieve a higher understanding, (3) the use of results student construction, (4) interactivity, and (5) relevance. Based on the expert opinion above, learning steps can be designed in the core activities according to the principles and characteristics of the Realistic Mathematical Approach, namely: (1) understanding contextual problems, (2) describing contextual problems, (3) solving contextual problems, (4) comparing and discuss answers, and (5) draw conclusions.

2.4 Critical Thinking Skills

Critical thinking skills are closely related to the ability to identify, analyze, and solve problems creatively and think logically. In the opinion of a cognitive psychologist Chance (Palinussa, 2013: 78) "Critical thinking as the ability to analyze facts, generate and organize ideas, defend opinions, make comparisons, draw conclusions, evaluate arguments and solve problems". The above statement asserts that the ability to think critically as an ability to analyze facts, generate and organize ideas, defend opinions, make comparisons, draw conclusions, evaluate arguments and solve existing problems.

According to Satria (2014: 90) that if low critical thinking skills will affect the level of students' way of thinking in solving problems and learning by teachers does not link science, environment, technology and society. One of the causes of mathematics is said to be difficult by students is because basically there are many concepts and principles in mathematics that are difficult for students to master so that concepts and principles not mastered result in students not having the skills to solve math problems properly (Liberna, 2012 : 193). The process of learning mathematics that takes place at school today is still dominated by teachers, so teachers are referred to as the main source of knowledge. In this case the teacher plays a very important role in the implementation of learning, so the method used must be in accordance with the conditions of the classroom conditions.

2.5 Learning Tools

The learning kit is a preparation process carried out by the teacher before they do the learning process. Therefore the preparation of teaching is one of the benchmarks of the success of a teacher. The education system has adopted a taxonomy of learning in the form of attitudes, knowledge and skills. Thus the learning process is fully directed at the development of all three domains in a holistic / holistic manner, meaning that the development of one domain cannot be separated from the other domains. Then the whole learning process gives birth to personal qualities that reflect a complete mastery of attitudes, knowledge, and skills.

Government Regulation (PP) Number 32 of 2013 related to changes to government regulation number 19 of 2005 concerning national education standards, "Learning Planning is the preparation of learning implementation plans for each learning load". Based on the legal basis above it can be concluded that a teacher must design a plan of learning activities that will be carried out from the beginning of the meeting until the end of the meeting that is loaded for each learning content. The intended learning plan design includes learning implementation plans, syllabus, teaching materials, learning methods, learning resources or

teaching materials, and assessment of learning outcomes. In this case, researchers limit the development of learning plans and learning resources for Student Worksheet.

III. Research Methods

This type of research is Research and Development with the design of learning development models by Dick and Carey. The steps include: 1) Conducting preliminary research; 2) Making Worksheets Students; 3) Collection of Worksheets Students data; 4) Developing Ethnomatematic Worksheets Students; 5) Product reviews and trials; and 6) Product effectiveness test. This research was conducted at 091358 State Elementary School, Haranggaol, Haranggaol Sub-District, Horisan. The subjects in this study were 4th grade students of primary school in SD Negeri 091358 using trial 1 and trial II. Data collection instruments in this development are assessment instruments to assess the products that have been developed.

3.1 Expert Validation of Learning Materials

Expert validation of learning materials towards the development of Worksheets Students based on realistic mathematical approaches nuanced Ethnomatematic in 4th of Primary School was carried out by Mr Mulyono who is a lecturer in the Postgraduate Program at Medan State University. The assessment was conducted to obtain information that will be used to improve and improve the quality of based on a realistic mathematical approach with Ethnomatematic nuance in 4th of Primary School in SD Negeri 091358 Haranggaol, Haranggaol Horisan Sub-District. The results of the validation take the form of an assessment score on aspects of the Mathematics learning material that includes the contents, the presentations, the comments and suggestions for improvement and conclusions.

The results of the overall assessment of learning material experts stated that the level of achievement score about the feasibility of the content and the feasibility of the presentation was 85.42 where the range was at the level of achieving the score 85-100 categorized as "Very Good". The results of the evaluation of rounding number material that connects the culture and environment of students' developed homes received several comments including: (a) each submitting material must include Based Competency, (b) before presenting the questions, it should present a way or example of working on the questions so that students understand how techniques to solve the problems presented, (c) writing units of Length and weight in the activity of remembering formulas and Worksheets Students 1 is recommended to be reorganized, (d) The formula presented in the activity of remembering before the activity "Let's Think 1" is less logical and needs to be clarified, (e) correct the sentences for each question, and the suggestions are to improve according to the results of the discussion. The conclusion of the assessment, comments and suggestions by material learning experts that Ethnomatematics Nuance Worksheets Students is worth testing in the field with revision.

3.2 Validation of Learning Design Expert

The validation of the learning design expert on the development of Ethnomatematics Nuance Worksheets Students on rounding numbers in 4th grade of Primary School was done by Dr. Daulat Saragi, M.Hum, lecturer in the Postgraduate Program at Medan State University. Based on the assessment that has been given to the development of Worksheets Students based on realistic mathematical approach nuanced ethnomatematic in 4th grade of Primary School in SD Negeri Haranggaol Horisan Sub- District, which includes aspects of physical appearance attractiveness, accuracy of design use, suitability of format, presentation

with target characteristics, clarity of Worksheets Students, clarity of material exposure, and suitability of evaluation with the material

The results of the assessment by learning design experts covering the aspects of the attractiveness of physical appearance, the accuracy of the use of the design, the suitability of the format, the presentation of the characteristics of the target, the clarity of media instructions, the clarity of the material exposure, and the suitability of the evaluation with the overall material can be concluded that the level of achievement of the score was 94.23 where the range is at the level of achieving a score of 85-100 is categorized as "Very Good". The results of the assessment of the learning design in the development of Worksheets Students based on realistic mathematical approaches nuanced ethnomatematic received several comments including: (a) the worksheet students' title on the Cover was improved, (b) the Length Units were ordered from top to bottom, (c) the name of Worksheet Students author is displayed at the bottom of the cover (d) correct the position of the drawing for each part filled with the picture. The conclusion of the assessment, comments and suggestions by design Learning experts that Worksheets Students based on realistic mathematical approach with ethnomatematic nuance is worth trying out in the field with revision.

3.3 Language Expert Validation

Validation of linguists on the development of Worksheets Students based on realistic mathematical approaches nuanced ethnomatematic in 4th grade of primary school conducted by Dr. Wisman Hadi, S.Pd., M.Hum is a Postgraduate lecturer in Medan State University. Based on the assessment instruments that have been given to linguists, the quality of Worksheets Students development based on realistic mathematical approaches with ethnomatematic nuances is assessed from all aspects contained in Worksheets Students validation sheet based on realistic mathematical approaches with ethnomatematic nuances for linguists. the results of the assessment by a language design expert that includes aspects of the use of words or the use of language in making Worksheets Students as a whole can be concluded that the level of achievement of the score of linguists 94.44 where the range is at the level of achieving 85-100 score categorized as "Very Good".

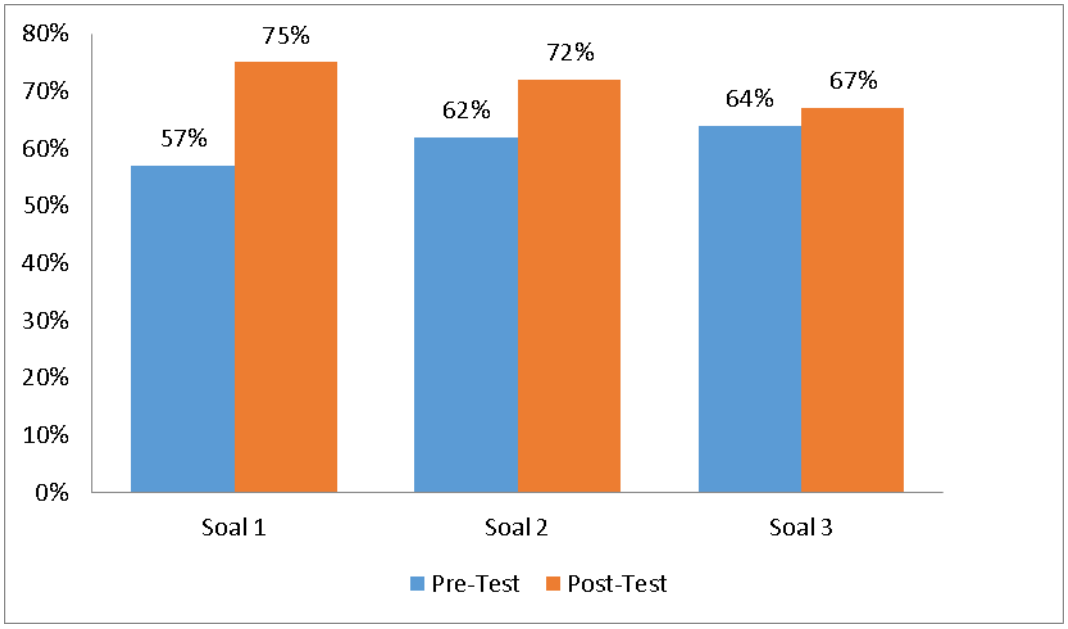
The results of the assessment and conclusions from the assessment, comments and suggestions by linguists that Worksheets Students based on realistic mathematical approaches ethnomatematic nuances deserve to be tested in the field with revision, and the results of linguist assessment on the development of Worksheets Students based on realistic mathematical approaches with ethnomatematic nuances received several comments including: (a) use spaces in the word "school", (b) put a period in each sentence, (c) fix every word that requires the first sentence of capital letters. (d) use language that is easily understood by students. The conclusion from the assessment, comments and suggestions by linguists that Worksheets Students based on realistic mathematical approaches with ethnomatematic nuance is worth testing in the field with revision.

3.4 Trial I

The first trial was conducted in class IV SD Negeri 091358 Haranggaol, Haranggaol Horisan District which consisted of 25 students. The purpose of this trial I is to identify product deficiencies. Evaluation and response from the first trial so that there is input in the form of criticism and suggestions regarding the presentation of Worksheets Students development products which include aspects of media appearance and media content based on a realistic mathematical approach to rounding subject matter. the results of the evaluation

and responses of the first trial to Worksheets Students based on a realistic mathematical approach as a whole were 81.67%. Based on the evaluation criteria of interactive learning media stated with the category "Very Good". In the implementation of the first trial which was conducted on 25 students of 4th grade of SDN 091358 Haranggaol, Haranggaol Horisan District there were comments and suggestions for Worksheets Students products based on realistic mathematical approaches that needed to be revised. Comments and suggestions from trial I.

There are 60% of students who have reached KB ≥ 70%. After students' completeness in the learning process individually and classically is analyzed, the results of the pre-test and post-test are calculated by the gain score and seen from the diagram below.

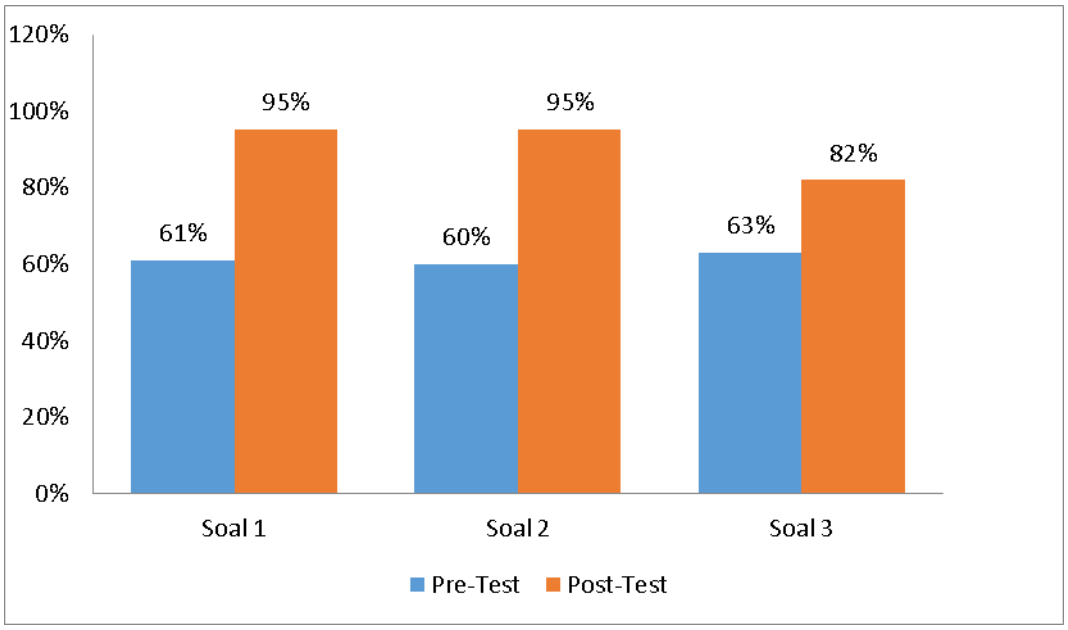


Pre-Test and Post-Test Results Diagram for Trial Students I

3.5 Trial II

Trial II was also conducted in 4th of SDN 095163 Haranggaol, Haranggaol Horisan Sub-District which consisted of 25 students, consisting of 10 students with high achievements, 10 students with medium achievements, and 5 students with low achievements. Trial II was conducted aiming to find out the shortcomings, weaknesses and input in the form of criticism and suggestions about the development of Worksheets Students products based on realistic mathematical approaches used in learning that includes aspects of the appearance of Worksheets Students and Worksheets Students material based on realistic mathematical approaches on the subject matter of rounding ethnomatematic nuances. Trial data II covering aspects of Worksheets Students appearance and Worksheets Students material based on a realistic mathematical approach on rounding up ethnomatematic numbers overall increased from 88.1% to 91.9% included in the "Very Good" category. The response of some students said that "picture listed very interesting and suitable to be used as learning, the design is in accordance with students who use, the selection of colors and shapes of Worksheets Students cover is quite interesting, by providing a real picture, it would be nice if all subjects used this Worksheets Students as a reference in evaluating learning

Based on individual learning completeness data according to the results of students' abilities it is known that there are 1 students who are "not yet finished" and there are 24 students who are "complete". Based on the complete classical learning completeness data above there are 96% of students who have reached KB 70%. After completeness of students in learning individually and classically analyzed, the results of pre-test and post-test are calculated by the gain score. To see an increase in the value and effectiveness of Worksheets Students that was developed between before and after using the gain score formula and can be seen with a diagram:



IV. Discussion

To find out the feasibility of Worksheets Students based on a realistic mathematical approach with ethnomatematic nuances rounding the numbers, validity tests are performed by material experts, design experts, and linguists. Where each expert gives an assessment on each indicator contained in the sheet, the learning media validation is in the form of a quantitative descriptive assessment questionnaire that is expressed in the distributor score and assessment scale category.

The validity that is carried out at the validity test stage is theoretical validity, that is, validity with experts and competent in their fields based on theoretical and logical considerations. There are 3 parts of Worksheets Students that will be validated, namely material, design, and language. The developed Worksheets Students needs to be validated to obtain eligibility so that it is suitable for use in learning. In the validation stage the researchers conducted a study with discussion techniques by showing the initial Worksheets Students design based on a realistic mathematical approach nuanced ethnomatematic integer material, to the design expert, material expert and linguist. In addition, researchers also provide validation sheets to the validator in order to get the theoretical validation results. The experts give an assessment in accordance with the validator sheet provided by researchers.

Based on the validation of material experts it is known that the validation assessment is 84.09% with valid criteria but there are still improvements from material experts. Material

experts suggest fixing simple words so they are understood by students. After revised the percentage to 92,11% valid with very valid criteria. The validator also suggested using materials that were appropriate to the culture of the surrounding environment. After discussing with material experts, Worksheets Students based on realistic mathematical approach with ethnomatematic nuances was revised based on validator input and suggestions.

Based on the validation of learning design experts based on aspects of content, presentation, linguistic appearance and content got an assessment of 78.57% in both categories. The validator suggested that the cover on the Worksheets Students used was more clarified, and the image size was enlarged so that all students could see clearly. After being revised, it is suitable for students to use.

Furthermore, Worksheets Students feasibility test tested on students I obtained a percentage of 81.67% and in the second trial of 25 people obtained a percentage of 88.42% with a very good category and very feasible to use. Based on the assessment given by the validator and also the assessment given by students against Worksheets Students based on the developed realistic mathematical approach and suggestions and input provided by experts, the Worksheets Students based on realistic mathematical approach with ethnomatematic nuance developed is said to be valid and appropriate for use in learning

The effectiveness of Worksheets Students based on realistic mathematical approach with ethnomatematic nuance can be seen through how the increase in student learning outcomes in the form of pre-test and post-test of individual learning completeness, classical learning completeness by seeing an increase in the results of the gain score, and questionnaire sheets of student responses to Worksheets Students used in learning that have been in individual learning do it.

The effectiveness of Worksheets Students was measured by using the results of the pre-test and post-test at the beginning of the learning and the end of the learning activities that had been carried out. Based on the pre-test results which amounted to 3 essay questions consisting of 15 items the students' pre-test data items can be seen in table 4.18 it can be seen that student learning outcomes are still low with an average of 71 with a standard deviation of 13.7 it is seen based on the minimum completeness criteria from the minimum completeness the school for mathematics is 70.

At the end of the learning activities and have used Worksheets Students, a Post Test was conducted to see the student learning outcomes. Based on the results of the post-test carried out, it can be seen that the post-test results of students reach an average of 71 with a standard deviation of 13.7. Based on the minimum school completeness reference for mathematics subjects is 70, it can be seen that learning outcomes have improved and it can be said that student learning outcomes have reached the minimum completeness criteria. Based on the completeness of the results of the II trial try out of students in table 4.18 it can be seen the classical learning completeness data the average student reaches 90 who have reached KB≥ 96%. After completeness of students in learning individually and classically in the analysis, the results of pre-test and post-test were calculated with a gain score to assess the increase in the effectiveness of Worksheets Students between before using and after using it obtained 0.73, the student's gain score was high. Based on the above results that there is an increase from before and after using, in line with that in the journal.

IV. Conclusion

Based on the results of the validity of material experts 85.42%, design experts 94.23%, and linguists 94, 44%. From the results of the validation of the Worksheets Students developed, the Worksheets Students is included in the very good criteria and is declared valid and is suitable for use. Ethnomatematic nuances Worksheets Students is categorized as practical because Worksheets Students responses from student responses from trial I and trial II have increased. It is seen that students prefer to use Worksheets Students in the implementation of mathematics learning with an average percentage of Test I student responses 88.1% and Test II student responses increased with a percentage of 91.9% interested in Worksheets Students. From these results it can be assumed that if the value is more than 90 then it is categorized very well. If the category is very good then the Worksheets Students has an ethnomatematic nuance practically used in learning, especially mathematics.

Based on the completeness data of students' critical thinking before using Worksheets Students, the average value reached 62, while after using individual completeness and classical average reached 90 with a gain score of 0.73 into the high category. And student questionnaire responses about the effectiveness of Worksheets Students reached 88% of 25 students. Based on this data Worksheets Students based on a realistic mathematical approach with ethnomatematic nuance is said to be effectively used in learning with the assumption that students' mathematical scores are higher when using Worksheets Students. The children's critical thinking ability increases as seen from student learning outcomes increase from those before using and after using the percentage in the first tryout 60% and in trial II 96% with a good category due to an increase in student learning outcomes. seen from the gain score in the first trial only got 0.26 low category with an average score of 61 pretest and post-test 71, so it is necessary to hold a trial design II. In the second trial, the score on the gain score was 0.73 in the high category with an average pretest achievement of 62 and in the posttest 90. So that it was concluded that the critical thinking ability of students increased with a value of 0.73 in the high category.

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