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Theme

"Issues and Challenges in Applied Mathematics and Mathematics Education"

Cimahi, Indonesia, July 31st, 2019

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REALISTIC MATHEMATICAL APPROACH BASED ON SOUTH BENGKULU COMMUNITY ETNOMATEMATICS TO INCREASE HARD WORK CHARACTERS

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Abstrac. This study aims to determine the realistic mathematical approach based on the South Bengkulu society ethnomatematics in improving the character of hard work. This research is an experimental study with data collection techniques through questionnaires and observation sheets. The subjects in this study were the eighth grade students of South Bengkulu State Second Middle School and South Bengkulu MTs Makrifatul Ilmi. The results of this study are (1) There is the influence of a realistic mathematical approach based on the South Bengkulu community ethnomatematics on the character of students hard work. The results of the Ancova test show that the p-value of each class is less than where each is 0,000 and 0,012. (2) Achieving the character of students hard work with a realistic mathematical approach based on the ethnomatatics of South Bengkulu society better than Conventional Learning.

Keywords: Realistic Mathematics Education, Ethnomatematics, Character Hard Work.

1. Preliminary

Learning mathematics as a national education system makes an important contribution in the formation of the character of students. This formation can be realized by incorporating character values in the delivery of mathematical material. Damayanti (2014: 12) states that character education is a jointly planned effort that aims to create the next generation that has good personal foundations, both in cognitive, feeling, and action.

The importance of character formation in students requires a bridge component to link it to learning. One effort is to carry out learning with an ethnomatematic reaslistic mathematical approach. Through ethnomatematic-oriented learning a society will be able to grow the character of students in accordance with the surrounding communityar.

The term ethnomathematics was coined by D'Ambrosio (1985) to describe the mathematical practices of identifiable cultural groups and may be regarded as the study of mathematical ideas found in any culture. D'Ambrosio (1990: 81) defined ethnomathematics in the following way: "The prefix *ethno* is today accepted as a very broad term that refers to the social- cultural context and therefore includes language, jargon, and codes of behavior, myths, and symbols. The derivation of *mathema* is difficult, but tends to mean to explain, to know, to understand, and to do activities such as ciphering, measuring, classifying, inferring, and modeling. The suffix *tics* is derived from *techné*, and has the same root as technique".

Rosa & Orey (2007) *ethno* refers to members of a group within a cultural environment identified by their cultural traditions, codes, symbols, myths, and specific ways used to

reason and to infer. While according to Davidson (1990) found that the interaction of culture and mathematical ideas are mutually reinforced when the application of culturally sensitive mathematical activities helps students to see the relevance of mathematics in their own culture and at the same time helps teachers to use this connection to teach even more sophisticated mathematics.

Teacher's knowledge and experience of culture are also very important because the teacher will teach students in the class using a culture-based approach so that classroom learning will be more effective. According to Zeichner (1996), in order for teachers to implement the principle of cultural congruence, they should have knowledge of and respect for the various cultural traditions and languages of students in their classrooms.

Haji (2012) explains that student character can be developed through realistic mathematics learning. Realistic Mathematics Approach is the learning of mathematics that uses the real world context as a first step to building students' knowledge and character, which is based on the principle: 1) *guieded and reinvention progressive mathematizing,* 2) *didactical phenomenology,* 3) *self-developed models* (Gravemeijer, 1994: 90). According to Treffers (1987) realistic mathematical approaches have five characteristics: 1) phenomenological exploration or the use of contexts; 2) the use of models or brigding by vertikal instruments; 3) the use of students own productions and constructions or students contribution; 4) the use of students own productions and constructions or students contribution; and 5) the intertwining of various learning strands.

Before carrying out the research an initial reflection was carried out with observations to observe the condition of students in State Middle School 2 and MTs Makrifatul Ilmi South

Bengkulu. It was found that the character of students in South Bengkulu State Middle 2 and South Bengkulu MTs Makrifatul Ilmi classified as still low where the average character of each class was 16.7%, there were students who slept during class hours; 20.8% often go out of class and 25% of the number of students in the class is not polite to teachers who teach. So that ± 50% of the total number of students in each class at the state junior high school and private junior high school that has been formed is not yet in line with the achievement of the 2013 curriculum. Based on the character of the student, then it can affect learning outcomes, the character of hard work. Where to achieve learning completeness is still below the minimum criteria of completeness, namely 70, in other words the learning outcomes of junior high school students in South Bengkulu are still relatively low.

Learning with ethnomatematic-based realistic mathematical approaches will enable material to be studied and their culture can generate learning motivation and understanding of material by students to be easier because the material is directly related to their culture, which is their daily activities in society. In addition, the cultural values that the teacher instills in students are part of building students who are characterized by increasing the character of hard work.

According to Wijaya (2012: 78) the character of hard work is a behavior that shows genuine effort in overcoming various obstacles to learning, assignments, and completing tasks as well as possible. By improving the character of hard work can build students personally to strive seriously in learning, both in class and outside the classroom. Students can also be polite, respectful and timely in doing something.

The research results of Prabowo & Sidi (2010) state that realistic mathematical approaches to characteristics (1) The use of models or brigding by vertical character instruments that can be developed are honesty, independence, persistence and hard work; (2) The contribution of students that can be developed is hard work, courage, and willingness to share the results of their thoughts.

Based on the background stated above, the problem of this study are: (1) Is there an influence of the realistic mathematical approach based on the South Bengkulu ethnomatematics on the character of hard work ?; (2) Is there a character achievement of the hard work of students taught through a realistic mathematical approach based on ethno-mathematical South Bengkulu society better than those taught through conventional learning?

Based on the formulation of existing problems, the objectives of this study are: (1) To determine the effect of applying a realistic mathematical approach based on South Bengkulu's ethnomatematics based on the character of students' hard work; (2) To find out the achievement of the character of the hard work of students taught through realistic mathematics learning based on ethnomatematics better than those taught through conventional learning

2. Research methods

This type of research is quasi-experimental research. According to Sugiyono (2013: 11) quasi-experimental research is a research method that is used to look for the effect of treatment (treatment) in controlled conditions (laboratory). This study was conducted on two classes namely the experimental class and control class. The experimental class is the class given treatment, while the control class is useful to determine whether there is a causal relationship from the given treatment. The population in this study were all eighth grade students of South Bengkulu State Middle 2 and South Bengkulu MTs Makrifatul Ilmi.

The research design used in Quasi Experimental is Nonequivalent Pretest Posttest Control Design. In this study, two classes were used, namely the experimental class as a class using ethnomatematic-based realistic mathematics learning and the control class as a class getting learning using conventional learning. Based on the description above, it is described as follows:

$$
\begin{array}{llll}
E & O_1 & X & O_2 \\
\hline
K & O_3 & Y & O_4
\end{array}
\quad \text{(Arikunto, 2010: 126)}
$$

Information:
E: experimental group
K: control group
O1: pretest in the experimental class
O3: pretest in the control class
O2: posttest in the experimental class
O4: posttest in the control class
X: treatment in the experimental class uses ethnomatematic-based realistic mathematical learning approaches
Y: treatment in the Control class using conventional learning.

This study starts from the preparation of instruments, expert validation, instrument testing, calculation of the validity and reliability of the instrument, giving treatment in the sample class and analyzing the data in the form of prerequisite testing namely normality test and homogeneity test and hypothesis testing.

The data analysis technique used is the prerequisite test and hypothesis test :
a. Data gain analysis is used to find out the magnitude of the increase in hard work character, the analysis is done by using normalized gain. The formula for normalized

gain uses the average (average normalized gain) by Meltzer (2002) which is considered more effective as follows:

$$g = \frac{\text{post - pre}}{100\% \text{ - pre}}$$

Information:

g : gain normalizes
pre : pretest score
post : posttest score
100% : Maximum possible score

b. Hypothesis testing of this study uses Ancova (Covariance Analysis). Ancova aims to reduce error variance by eliminating the influence of non categorical variables (metrics or intervals) that are believed to bias the results of the analysis. The basic formula of Ancova is in principle the same as Anava, the difference is that if ANOVA is only known to JK, then in Ancova other than JK it is known JP (Number of Multiplication), where JP satisfies the equation:

$$JP(T) = JP(A) + JP(D)$$

The source of variance in Anova is total, inside, and between by calculating JK and JP for various things. In Ancova there are JKy, JKx and JP (Neter, et al. 1990).

3. Results and Discussion
a. Research result

The study was conducted in two schools with each school consisting of two research classes namely experiment and control class. The results of the study are described based on the results of the character questionnaire analysis of the students' hard work. The research questionnaire measures aspects: (1) earnest, (2) on time, (3) does not despair, (4) focus on learning.

The results showed that there were differences in the achievement of the character of hard work between learning carried out with realistic mathematical approaches (experimental class) and conventional approaches (control class). The description of the results of the assessment of hard characters is described based

on the criteria of five rating scales, namely: (1) very good, (2) good, (3) sufficient, (4) lacking, and (5) very lacking. The results of each characteristic of hard work are presented in the following figure.
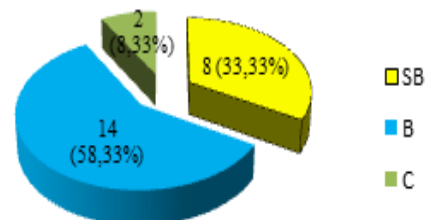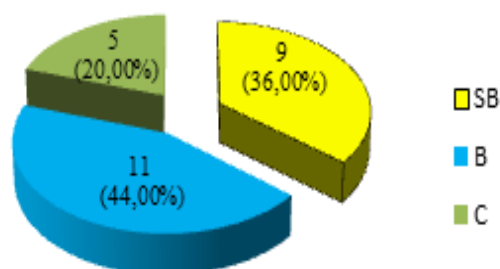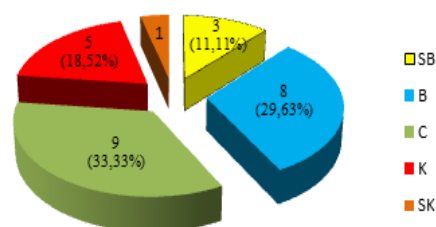

Picture 1
Results Class experiment 1

Figure 2
Results Class experiment 2
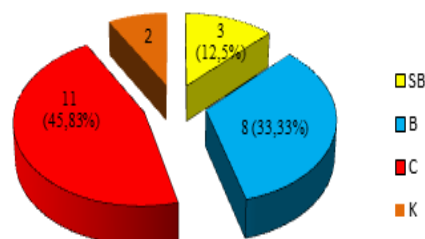

Gambar 3
Hasil Kelas Kontrol 1

Figure 4
Control Class Results 2

The picture above shows that the percentage of assessment in the experimental class is in the good and very good category. In contrast to the results of the assessment in the control class given learning with a conventional approach the average category in the category is sufficient and good. Comparison of the results of the analysis of student work characteristics such as the following table.
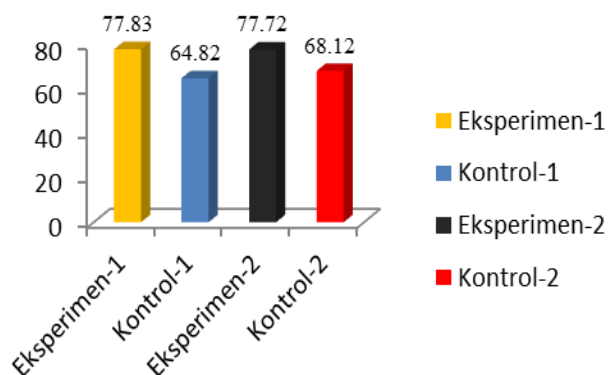

Figure 5
Comparison of Postest Results of Hard Work Character

The results of hypothesis testing carried out in the study consisted of two, namely:

H_1 : There is the influence of the realistic mathematical approach based on the South Bengkulu society ethnomatematics on the character of students' hard work

H_2 : The achievement of the character of the hard work of students taught through realistic mathematical approaches based on the ethnomatematics of South Bengkulu society is better than those taught through conventional learning

The test results of the influence of the Realistic Mathematical Approach based on the South Bengkulu community ethnomatematics on the character of students' hard work

The results of testing the hypothesis using the Ancova test indicate that the significance value of the Public Middle School and Private Middle School is less than 0.005. In the first research class (SMP 2) a significance value of 0,000 and the second research class (Private Middle School) a significance value of 0,012. This shows that the hypothesis is accepted so that there is an influence of PMR based on South Bengkulu society ethnomatematics on the character of students' hard work.

Test Results The achievement of the character of the hard work of students taught through a realistic mathematical approach based on the South Bengkulu society ethnomatematics is better than those taught through conventional learning

Differences in achievement were analyzed by the gain test. The test aims to see whether the increase that occurs due to giving significant action or not. The gain test results in the first research class are presented in the following table.

Table 1
Results of SMP 2 research class test

Treatment	Average	Information
Eksperimen	0,71	Heigt
Kontrol	0,59	Moderate

The results in the table show that the experimental class gain average value is 0.71 with high criteria. Whereas in the control class is 0.59 with the criteria being moderate. Based on these data it can be concluded that the achievement of the character of hard work in the first research class is known to be better by being given learning with a realistic mathematical approach based on ethnomatematics. In line with this, the results of the gain test in the second research class were South Bengkulu MTs Makrifatul Ilmi as in the following table.

Table 2
The results of the MTs Makrifatul Ilmi research class

Treatment	Average	Information
Eksperimen	0,67	Moderate
Kontrol	0,32	Low

The results of the gain test show that in the class given learning with ethnomatematics-based PMR approach an increase in the character value of hard work is more effective than conventional learning. Besides can form hard work character value, etnomatika also contain mathematics values (Haji & Yumiati, 2018).

b. Discussion

The findings of the study were reviewed in the implementation of learning with a realistic mathematical approach based on the ethnomatematics of the people of South Bengkulu. The impact of the learning treatment was observed, namely increasing the character of the hard work of students with four components, namely: (1) earnest, (2) on time, (3) not discouraged, (4) focusing on learning. The results showed that learning with a realistic mathematical approach based on ethnomatematics of South Bengkulu society could improve the character of students' hard work compared to conventional learning. Besides, learning mathematics can improve creative character and think critically (Haji, Zamzaili, Yumiati, 2018).

The study and observations in the implementation of the study showed students tend to be more active in being taught the PMR approach. The phase of the implementation of learning carried out in the study, namely: (1) the phase of Use of Contextual Problems, (2) Phase of Use of Models for Progressive Mathematics, (3) Phase of Interactivity and Conclusion, and (4) Phase of Utilization of Construction Results of Students and Discussion.

In learning, the phase can develop the character of students' hard work at the stage of using progressive mathematical models and interactivity and making conclusions. In these two stages students tend to try to solve the problems encountered. In addition, the dominating phase increases the ability to work hard at the stage of making conclusions. Students who are guided to make conclusions will demand hard work from these students. This is in line with Prabowo & Sidi (2010) mentioning that the realistic mathematical approach to characteristics

contributes characters who can develop the character of hard work. This matter as according to result of research of Haji (2013) said that mathematics give contribution to development of student character.

In addition, the learning stages outlined in the LKPD steps can encourage the development of the character of students' hard work. Through demands for problem solving, students will be required to work seriously. In addition, the provision of processing time for LKPD will also grow students in completing assignments on time and focus more on learning.

As shown in the following figure is the phase of students in using contextual problems to be able to model for progressive mathematicians.

Figure 6
Phase of Use of Contextual Problems (Bamboo)

Figure 7
Phase of Use of Contextual Problems (Tat Cakes)

Can be seen in the picture above shows the character of hard work on improvement really, not despair and focus on learning in the use of phase contextual problems. B

Following are the stages of interactivity phase and making conclusions, students explain the class ahead of what they find from activities in the LKPD. So that together students and teachers make conclusions.

Figure 8
Interactivity and Making Conclusions

From the phases of learning are questionnaires to students, following the hard work character questionnaire filled by State Junior High School and Private Junior High School students.

No	Butir Pertanyaan	Skala Penilaian				
		1	2	3	4	5
1	Saya termotivasi untuk belajar matematika karena pembelajaran dikelas menyenangkan.				✓	
2	Langkah kegiatan dan gambar yang ada membantu saya dalam menemukan konsep dari materi yang diajarkan					✓
3	Saya dapat menerapkan konsep matematika yang telah saya temukan					✓
4	Pembelajaran ini dapat membantu dan mendorong saya untuk aktif dalam pembelajaran				✓	
5	Saya mengikuti pembelajaran matematika dengan sungguh – sungguh					✓
6	Setiap guru memberikan tugas, saya mengerjakan dengan tuntas dan selesai pada waktunya			✓		
7	Ketika ada hal yang kurang saya mengerti, saya berusaha menanyakan kepada guru saat					✓

	itu juga				
8	Saya merespon baik setiap kegiatan pembelajaran matematika yang saya ikuti				✓	
9	Saya akan selalu berpartisipasi aktif dalam pembelajaran matematika					✓
10	Saya mengumpulkan tugas selalu tepat waktu				✓	
11	Ketika pembelajaran matematika berlangsung, saya memperhatikan dan menyimak penjelasan ibu guru dengan seksama					✓
12	Saya merasa sangat tertantang jika menghadapi suatu permasalahan matematika dan berusaha sampai menemukan penyelesaiannya				✓	
13	Saya tidak mengalami kesulitan jika harus menyimpulkan penyelesaian dari suatu masalah dalam matematika			✓		
14	Saya selalu fokus pada pembelajaran, ketika guru sedang menjelaskan materi.					✓
15	Saya merasa harus menyelesaikan permasalahan yang diberikan oleh guru dengan tepat waktu.					✓
16	Saya tidak pernah ribut dikelas, ketika guru sedang menjelaskan materi			✓		
17	Saya selalu mengecek kembali jawaban – jawaban saya, jika guru memberikan tugas					✓
18	Saya merasa tertantang jika diberikan soal yang sulit				✓	
19	Belajar matematika menyenangkan dan banyak gunanya dikehidupan sehari – hari, sehingga saya lebih mudah memahaminya.				✓	
20	Saya selalu ingin belajar matematika, bagi saya pembelajaran matematika membuat saya tertantang dalam menyelesaikan soal – soal yang rumit.					✓

Figure 8
Student Hardwork Character Questionnaire

4. Closing
a. Conclusion

1) There is the influence of a realistic mathematical approach based on South Bengkulu's ethnomatematics on the character of students' hard work. The results of the childova statistical test showed a significant influence between learning with ethnomatematics-based PMR approach as indicated by the p-value of each research class less than alpha, namely: 0,000 and 0,012.

2) Achieving the character of the hard work of students taught through a realistic mathematical approach based on the ethnomatematics of the South Bengkulu community is better than those taught through conventional learning. This is indicated by the results of each gain test analysis with the class given

ethnomatematics based PMR learning with high criteria.

b. Suggestion

1) In using the ethnomatematics-based PMR approach the community should first observe the habits of the surrounding community and the conditions of students who are familiar with the activities of the surrounding community.

2) To implement ethnomatematics-based PMR learning, teachers should make their own LKPD to facilitate the delivery of subject matter. The LKPD is made interactive and the presentation of data in detail and steps must be clear and use problems related to student life.

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