International Journal of Trends in Mathematics Education Research
Vol. 1, No. 1, June 2018, pp. 35-38
Available online at http://ijtmer.com

E-ISSN : 2621-8488

RESEARCH ARTICLE

The Effectiveness of Mathematics Teaching Material Based on Ethnomathematics

Aritsya Imswatama[1]*, Hamidah Suryani Lukman[1]

[1]Department of Mathematics Education, Universitas Muhammadiyah Sukabumi, Sukabumi, Indonesia
**Corresponding author: [1]* iaritsya@gmail.com; [1] hamni_alkhawarizmi@yahoo.co.id*

How to Cite: Imswatama, A & Lukman, H.,S. (2018). The Effectiveness of Mathematics Teaching Material Based on Ethnomathematics. *International Journal of Trends in Mathematics Education Research, 1*(1), 35-38. doi:10.33122/ijtmer.v1i1.11

ARTICLE HISTORY

Received: 5 March 2018
Revised: 28 April 2018
Accepted: 19 May 2018

KEYWORDS

Ethnomathematics
Mathematics teaching material
Solving problem skill
Mathematical critical thinking

ABSTRACT

The study aims to know the effectiveness of mathematics teaching material used based on ethnomathematics toward mathematical solving problem skill and student critical thinking and to know how student activity on mathematics learning by applying mathematics teaching material based on ethnomathematics. Research method applies a quantitative method with post-test only control design research type. Sampling technique applies cluster random sampling. Data collection technique applies documentation, observation, and test method. Data analysis technique applies quantitative data analysis by using t-test. Based on data analysis result, mathematics teaching material based on ethnomathematics proves effective toward solving problem skill and student mathematical critical thinking. Besides, by applying mathematics teaching material can raise student activity.

1. INTRODUCTION

Mathematics is an important science to be learned because mathematics is a science that has a unique characteristic as science, which has an abstract object, the pattern on axiomatic and deductive thinking, and based on truth (Afandi, 2018; Mursalin et al, 2018; Fonna, 2018; Amalia et al, 2018). With such unique characteristic, mathematics is useful in developing skill and creating learner personality (Mawaddah, 2015; Flora, 2017; Setiawan, 2006; Trisnawati, 2018). Mathematics as base science is also needed to achieve high-quality success. Therefore, mathematics is thought to all level school from elementary to university. Besides, mathematics is applied science to solve the problem in daily life.

One of mathematics role is to prepare learner in order to be able to face the changing condition or challenge in life, which always develops (Haydon, 2010; Woods, 2010). Besides, the learner is expected to be able to apply mathematics and think mathematical in daily life (Yusrina, 2017; Artut, 2009). That's why in learning mathematics is not only to understand mathematics concept and theory in solving problems. According to Mawadah (2015), the way of solving a problem that is obtained by the learner is a result from knowledge and experience, which is had by learner relates to the problem that wants to solve. So that, the teacher must be able to help learner give meaning in learning mathematics and build the skill of student mathematical problem solving to deepen student's comprehension toward mathematics.

According to Regulation of the Minister for Education Indonesia (Permendiknas) No. 23, 2006, mentioned mathematics lesson needs to be given to all learners in every education level as a base to provide the learner with the skill of thinking logical, analysis, systematic, critical, creative, and cooperate. Based on such thing, one of skill that must be had by learner after learning mathematics is a skill to think critically. Critical thinking skill is needed to solve a problem that is faced in daily life (Zakaria, 2007; A.K. Uswatun, 2016; Isjoni, 2010). Therefore, Critical thinking skill particularly doing math needs special attention in the learning process. In learning process at class, the teacher has to instill solving problem skill and to think critically in mathematics by relating mathematics problem with daily life and culture values in society (Alangui, 2017; Cimen, 2014; Eyal, 2018). So that learner is not only to get knowledge about mathematics but know culture values in society as well.

The fact that solving problem skill and Indonesian student mathematical critical thinking is still far from what is expected. It shows from Indonesian student achievement according to the Programme for International Student Assessment (PISA) survey in mathematics 2016 is in 63 ranks from 69 countries. Besides, based on observation in some schools in Sukabumi Municipality, in mathematics learning, the teacher still applies conventional learning which learning process usually begins by explaining concept informatively, giving example test, and is ended by giving exercise test. It causes the result from such learning is more focused to memorize process than solving the problem or to think critically in mathematics.

Based on an interview with mathematics teacher in Sukabumi Municipality, the teacher still has difficulty in learning that aims to increase critical thinking skill because the teacher is not used to develop learning which aims to increase critical thinking skill. Availability of mathematics book for Junior High School and High School that gives exercises based on critical thinking skill or solving problem is still less. Therefore, it needs teaching the material, which can help the teacher in developing critical thinking skill and learner

solving problem skill whether in Junior High School level or High School.

Teaching material that is used should be able to facilitate teacher to transfer value and knowledge. So that, the teacher is not only transfer knowledge about mathematics but also transfer local wisdom value in leaner's environment. According to Fitroh and Himawati (2015) education and culture is something that can not be avoided in daily life because culture is a unity which is applied in society. One of that is able to be a bridge between culture and education is ethnomathematics (Verner, 2013). According to Fitroh and Himawati (2015), ethnomathematics is mathematics, which it had an influence or is based on culture. So far as it needs mathematics teaching material based on ethnomathematics that relates mathematics to real condition and culture in society. With mathematics teaching material, which relates mathematics material with culture is expected to be able to train leaner in solving problem and mathematical critical thinking skill.

Regardless of importance problem above mentioned, so that it is applied mathematics learning that uses mathematics teaching material based on ethnomathematics, which aims to increase mathematics solving problem skill and student mathematical critical thinking. The research aims at knowing how the effectiveness of applying mathematics teaching material based on ethnomathematics toward student mathematical solving problem skill and observing how student activity on applying mathematics teaching material based on ethnomathematics student.

2. METHODS

The research method used are a qualitative method with research type of post-test only control design. The population is all VII grade students of Public Junior High School (SMPN) 2 Cibadak Sukabumi Regency. Sampling technique applies cluster random sampling. From sampling, the result is obtained two classes that each class becomes experiment class and control class. Experiment class is a class that applies mathematics teaching material based on ethnomathematics learning meanwhile control class is a class that does not apply mathematics teaching material based on ethnomathematics learning. Data collection technique applies documentation, observation, and test method. Data analysis technique applies quantitative data analysis by using t-test.

3. RESULTS AND DISCUSSION

Based on the research results, an average score of experiment class is higher than the average score of control class, whether from critical thinking skill test or solving problem skill, the result can be seen from the table as follows.

Table 1. Results of final ability test

	Solving Problem Skill			Critical Thinking Skill		
	Max	Mean	St.Dev	Max	Mean	St.Dev
Experiment Class	81	51,226	18,581	95	67,903	15,202
Control Class	50	31,323	13,328	73	41,258	17,624

Based on the table can be concluded that average score of solving problem skill and student critical thinking skill that applies mathematics teaching material based on ethnomathematics is higher than the student does not apply mathematics teaching material based on ethnomathematics. If it is seen from t-test analysis, based on the result of t-test calculation between experiment class and control class on solving problem test is got the score to be as much as 2,222 meanwhile $t_{\text{-table}}$ = 1,671. From the result, it can be seen that to be > $t_{\text{-table}}$. It shows that the average score of experiment class is better than the average score of the control class. It can be concluded that applying mathematics teaching material based on ethnomathematics is better than learning, which does not apply mathematics teaching material based on ethnomathematics on student solving problem skill. For student critical thinking skill test, if it is seen from t-test analysis, is obtained a score to be as much as 2,225 with $t_{\text{-table}}$ = 1,671. From such result, it can be seen that to be > $t_{\text{-table}}$. It shows that the average score of experiment class is better than the average score of the control class. From such a result, it can be concluded that applying mathematics teaching material based on ethnomathematics is better than learning, which does not apply mathematics teaching material based on ethnomathematics on student mathematical critical thinking skill.

The use of mathematics teaching material based on ethnomathematics proves effective toward solving problem skill and student mathematical critical thinking skill because this teaching material has a group of material and mathematics question that is related to local culture and contextual problem in the field that aims learner get experience in mathematics learning. According to Arisetyawan et al (2014), mathematics learning approach that is viewed from a culture point of view has a purpose to build a bridge between student knowledge background and formal mathematics learning at school. Dahlan and Permatasari (2018) stated that teaching material based on ethnomathematics on collection topic affords to facilitate students in constructing their knowledge inductively though they are still difficult in compiling form of mathematics formal.

The student is introduced to some objects that have culture and mathematics element in teaching material based on ethnomathematics. In this case, the student is introduced and is remembered about the shape and Sundanese local unique object, which is always seen then it is related to mathematics elements. For example in this teaching material is Leuit. Leuit is a building to keep paddy. From the leuit picture, there are some geometries among another trapezoid, triangle, square, and parallelogram. With the relation between mathematics learning and local culture so that student will have more motivation in studying mathematics and student will also obtain local cultural knowledge. See the Figure 1.

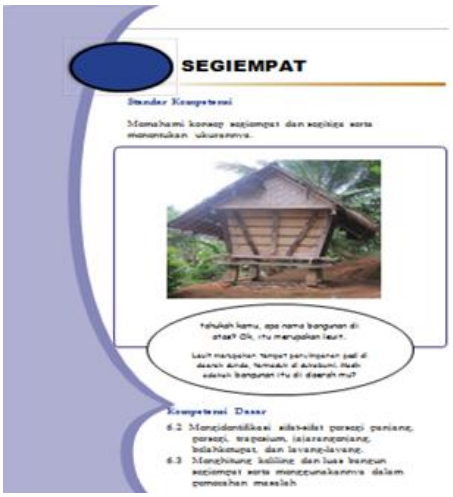

Figure 1. Examples of display teaching materials

This teaching material is also given the problem to open students knowledge about material that is going to be studied. The given problem is a problems that relates to society local wisdom in Sukabumi area. In solving the problem, a student is given stimulation to find some concepts about the definition, characteristic, circumference, and rectangular large by conducting an experiment with tool and object around the area.

To raise student's solving problem skill, in this teaching material is also given some solving problems questions which solution is designed based on Polya solving problems, there are (1) Making or arranging mathematic model that covers skill to formulate problem of daily situation in mathematics, (2) Choosing and developing strategy of solving problem that covers skill to bring up some possibilities or alternative formula solution or which knowledge that can be used in solving such problem, and (3) Enable to explain and to check the true answer that is got, covers skill to identify calculation mistakes, mistake of formula use, and enable to interpret obtained solution. Therefore, student's solving problem skill can be trained well by using this mathematics teaching material based on ethnomathematics.

This teaching material also has critical thinking questions that aim to raise student skill in critical thinking. According to Johnson (2007), critical thinking is a directed process and clear which is used in mental activity such as, solving problem, taking a decision, persuading, analyzing assumption, and conducting scientific research. In this teaching material, the student is given a problems and the student is demanded to solve the problems, take a decision, analyze assumption, and conduct scientific research so that by applying such teaching material, student's critical thinking skill will be trained.

Besides that, effective toward critical thinking skill and solving problem skill, this teaching material can also raise student learning activity. Based on observations, student learning activity by applying this teaching material has an increase. This increase can be seen from student motivation in the learning activity. Students are more enthusiastic and more active to learn mathematics because there is an activity to solve problems and direct practice uses media, which comes from the objects around them. Students are also interested to study mathematics because it is related to culture and local wisdom around their area so that students not only get information about mathematics material but also students get information about culture in student's area.

4. CONCLUSION

Based on the results of data analysis and hypothesis testing in this study, it can be concluded that mathematics teaching material based on ethnomathematics proves effective toward solving problem skill and student mathematical critical thinking. Besides, by applying mathematics teaching material can raise student activity.

Acknowledgements

Thank you for Institute of Research and Community Service (LPPM) Universitas Muhammadiyah Sukabumi and the Directorate of Research and Community Service at the Ministry of Research, Technology and Higher Education of the Republic of Indonesia for providing opportunities to carry out research and provide funding so that this research can be carried out.

REFERENCES

Afandi, A. (2018). Difference of learning mathematics between open question model and conventional model. *Malikussaleh Journal of Mathematics Learning (MJML)*, *1*(1), 13-18.

A.K. Uswatun Hasanah, Tri Atmojo Kusmayadi dan Riyadi. (2016). Eksperimentasi Model Pembelajaran Numbered Head Together (NHT) dan Think Pair Share (TPS) Pada Materi Bentuk Aljabar Ditinjau dari Kecerdasan Emosional Kelas VII SMP Negeri se-Kabupaten Lombok Utara Tahun Ajaran 2015/2016. *Journal Elektrik Pembelajaran Matematika.* Vol 4, No.10 PP 924-935

Alangui, W. V. (2017). Ethnomathematics and Culturally Relevant Mathematics Education in the Philippines. Ethnomathematics and Its Diverse Approaches for Mathematics Education, 183–208. doi:10.1007/978-3-319-59220-6_8

Amalia, R., Saiman, S., Sofiyan, S., & Mursalin, M. (2018, September). Designing computer-based fraction worksheets for junior high school. In *Journal of Physics: Conference Series* (Vol. 1088, No. 1, p. 012110). IOP Publishing.

Artut, P.D. (2009). Experimental Evaluation Of The Effects Of Cooperative Learning On Kindergarten Children's Mathematics Ability. *International Journal of Educational Research,* No 48, pp 370–380.

Arisetyawan. (2014). Study of Ethnomathematics: A lesson from the Baduy Culture. *International Journal of Education and Research. Vol.2 No.10. P.681-688.*

Cimen, O. A. (2014). Discussing Ethnomathematics: Is Mathematics Culturally Dependent? Procedia - Social and Behavioral Sciences, 152, 523–528. doi:10.1016/j.sbspro.2014.09.215

Dahlan, Jarnawi A dan Permasari, Revina. (2018). Pengembangan Bahan Ajar Berbasis Etnomatematika dalam Pembelajaran Matematika Sekolah Menengah Pertama. *JNPM (Jurnal Nasional Pendidikan Matematika) Vol 2(1) hal 133-150.*

Dimyati, Mudjiono. (2009). *BelajardanPembelajaran*. Jakarta: Rineka Cipta.

Eyal, L. (2018). Dilemma Based Learning Integrated Collaborative Technologies - Teacher Education Course Model. Edulearn18 Proceedings. doi:10.21125/edulearn.2018.1213

Fitroh Wahyu dan Himawati Nurul. (2015). Identifikasi Pembelajaran Matematika dalam Tradisi Melemang di Kabupaten Kerinci Provinsi Jambi. *Prosiding Seminar Nasional Matematika dan Pendidikan matematika UMS 2015.*

Flora Astyna Puri Tarigan, Sdy Suryan dan Yusnaedi. (2017). The Difference In Improving Student's Mathematics Understanding and Ability Of Visual Thingking By Using Cooperative Learning Model Types Think Pair Shared (TPS) and Numbered Head Together (NHT) At SDN Percobaan Medan. *IOSR Journal Of Research and Method In Education (IOSR-JRME)*. Vol 7 Issue 6 PP 78-81.

Haydon,T, Mahedy, L and Hunter , W. (2010). Effects Of Numbered Head Together On The Daily Quiz Scores and On-Task Behavior Of Students With Disabilities. *Journal Of Behavioral Education.* Vol.1.pp. 222-238.

Isjoni. (2010). *Cooperative Learning Efektifitas Pembelajaran Kelompok.* Bandung: Alfabeta.

Mawadah, Siti. Anisah, Hana. (2015). Kemampuan Pemecahan Masalah Matematis Siswa pada Pembelajaran Matematika dengan Menggunakan Pembelajaran Generatif di SMP. *EDU-MAT Jurnal Pendidikan Matematika, Vol.3, No.2. P.166-175.*

Mustika & Buana. (2017). Penerapan Model Pembelajaran *Probing Prompting* Terhadap Kemampuan Pemecahan Masalah Matematika Siswa. *Journal of Mathematic Education and Science. Vol.2, No. 2 P.30 – 37*

Miftahul Huda. (2010). *Cooperative Learning*. Yogyakarta. Pustaka Pelajar.

Mursalin, M., Nuraini, N. L. S., Purnomo, H., Damayanti, N. W., Kristanti, D., Rohim, A., ... & Fonna, M. (2018, September). The development of algebra teaching materials to foster students' creative thinking skills in higher education. In *Journal of Physics: Conference Series* (Vol. 1088, No. 1, p. 012101). IOP Publishing.

Permendiknas No 23 Tahun 2006. *Standar Kompetensi Lulusan untuk Satuan Pendidikan Dasar dan Menengah.* Jakarta: Pusat Kurikulum, Badan Penelitian dan Pengembangan Depdiknas.

Setiawan. (2006). *Model Pembelajaran Matematika dengan Group Investigation*. [online]. Tersedia http://guru-matematika.com. [5 Januari 2013].

Slavin, Robert E. (2005). *Cooperative learning*. Bandung: Nusa media.

Syaiful Sagala. (2010). *Konsep dan Makna Pembelajaran*. Bandung: Alfabeta.

Trianto. (2011). *Model-Model Pembelajaran Inovatif Berorientasi Kontuktivistik*. Jakarta: Prestasi Pustaka.

Trisnawati, T., Pratiwi, R., & Waziana, W. (2018). The effect of realistic mathematics education on student's mathematical communication ability. *Malikussaleh Journal of Mathematics Learning (MJML)*, *1*(1), 31-35.

Verner, I., Massarwe, K., & Bshouty, D. (2013). Constructs of engagement emerging in an ethnomathematically-based teacher education course. The Journal of Mathematical Behavior, 32(3), 494–507. doi:10.1016/j.jmathb.2013.06.002

Wahyudin. (2009). *Pembelajaran Matematika*. [online]. http://repository.upi.edu. [12 Januari 2013].

Wina Sanjaya. (2010). *Strategi Pembelajaran*. Bandung; Kencana.

Woods, D.M dan Chen, K.C. (2010). Evaluation Techniques For Cooperative Learning. *International Journal of Management & Information Systems*. Vol 14, No.1.

Yusrina Santri Nasution dan Edy Surya. (2017). Application of TPS Type Cooperative Learning in Improving Student's Mathematics Learning Outcomes. *International Journal Of Sciences Basic and Applied Research (IJSBAR)*. Vol 34, No. 1 PP 116-125.

Zakaria, E and Iksan, Z. (2007). Promoting Cooperative Learning in Science and Mathematics Education: A Malaysian Perspective. *Eurasia Journal of Mathematics, Science & Technology Education. Vol* 3, No 1, pp 35-39.