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Ethnomathematics Contained of Guided Inquiry for Elementary School Fourth Grade Student

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Abstract

The purpose of this study was to develop learning tool of Guided Inquiry learning model, in term of Ethnomathematics contained validity, effectiveness, and practicability of the learning model. The design of this study is Research and Development (R&D) from Thiagarajan with 4D, namely define, design, develop and dissemination, at the define step which is to find the problem of low mathematical values, at this design stage planning syllabus, lesson plans, learning devices are designed. At the development stage the author combine mathematics and Cirebon culture in a learning tools, and than final stage dissemination learning tools. Limited trial of learning device is conducted in SDN 1 Kalitengah, trial design is using Pretest-Posttest Control Group Design. SDN 2 Kalitengah is as experimental class and SDN 3 Kalitengah as control class. The technique of collecting data in this study is with test technique and non-test technique. Non-test technique in this study is using observation method, documentation, and questionnaire. The instrument of study is observation sheet, validity sheet of learning device of Guided Inquiry contained Ethnomathematics. The technique of analyzing data is using pre-requirement test (validity test, reliability test, different power, difficulty level, normality test, and homogeneity test), N-gain test, and independent sample t test. The result of study, learning device that is developed categorized valid to be used with score result on the average lesson plan (RPP) 3.35, Syllabus 3.46, teaching materials 3.43, student work sheet (LKS) 3.37 and study result test 3.49. The result of effectiveness of learning device shows progress of mean of study result before applying in number 61.97 and after applying in number of 89.72, N-gain score of experimental class in number of 0.73.

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INTRODUCTION

Globalization and modernization era like today cannot be ignored. The situation can affect positive and negative influences to societies. For ASEAN countries, in 2016, based on agreement, the ASEAN Economy Society (or *Masyarakat Ekonomi ASEAN* (*MEA*) has been applied. The application of *MEA*, indirectly is able to influence our culture; for example foreign labors bring their culture from their countries, which is probably not suitable to the norms prevailed in the society. Besides the anxiousness of foreign cultures which will disturb local norm prevailed in our people, this demand is also caused by the avowal of our country richness by one of neighbor country, so this needs education to accustom the local norms since child.

The quality of mathematics education in Indonesia is still low if we compare with other countries. It is proved from the result of mathematics study result in TIMMS. The Indonesian achievement in 1999 only got 32nd rank from 38 countries with average score 435. In 2003, Indonesia was in 37th from 46 countries with average score 420. In 2007, Indonesia got 35th rank from 49 countries with average score 427 (*Litbang Kemendikbud*, 2012). This is informed by TIMMS (2011) that Indonesian's rank decreases and has position in 40 from 42 countries with average score 407. The new result from TIMMS in 2015 shows that Indonesia decreased significantly with positioning in 45 from 48 countries with average score 397 (Rachmawati, 2012).

According to the observation results, it was found that there were some problems regarding with the importance of culture and good understanding of mathematics. One of them was learning device used at the school. It was the thematic book of curriculum 2013, which was urged by the government, but it was not integrated by the local and cultural norms at the region. More over, it was found the unsatisfied result at final test of semester; from 30 students, only 10 who had gotten above minimum completeness criteria (*KKM*). This related to the learning process there which lacked of fun because of the use of conventional method or lecturing method. The school has not conducted the innovative learning like inquiry model. In addition, there is no learning media in mathematics class, so students only study abstractly. The learning there is also rare to use discussion method, so it makes students having high egoism.

The analysis at students' mathematics book class IV in the topic of two-dimentional figures is still incomplete, and there are no texts and information about the local wisdom norms. In this case, the culture is at culture norms of Cirebon society.

The result of analysis was supported with observation result at class IV SDN 1 Kalitengah. The observation results are as follow: (1) learning devices which were used by the teachers were students' book and books from government, (2) teachers tend to be rare to do practical activity in delivering mathematics material because of limited times, (3) there is no enough time to deliver, because of each material should be finished in a day, each sub-theme should be finished in a week, and each theme should be finished in a month, (4) teachers lack of interest to develop their learning devices because of limited time.

The low interest of teachers in developing learning devices was mentioned by Zuriah *et al.* (2016), namely teachers have not had experience and special competence in developing innovative learning devices and have not followed teacher's competence improvement in making and developing innovative and creative learning devices.

Based on the result of analysis of students and teacher's book of curriculum 2013 in the theme of two-dimentional figures and the low interest of teachers in developing learning devices, so it needs right development of learning devices and hoped to be able to improve students' study result. The learning device which is developed in this research combines mathematics study, namely *two-dimentional figures* study with content of Cirebonese local wisdom norms, or familiar with ethnomathematics. With the learning devices contained ethnomathematics

based on Cirebonese society culture, it is hoped to make students interested to study mathematics. So that, it will not change concept which teachers have is memorizing, but will understand the concept, then will apply I daily life.

METHODS

This research is *Research and Development (R & D).* The procedure of development used is with research model with using 4 steps modified to be 3 research steps namely *Define*, *Design*, and *Develop*. The beginning test of product was conducted in SDN 3 Kalitengah. Trial design used *Pretest-Posttest Control Group Design*. SDN 1 Kalitengah was as experimental class and SDN 2 class was as control class.

The technique of collecting data in this research is with technique of test and non-test. Non-test method in this research used observation, documentation, and questionnaire. The research instruments are observation sheet, validation sheet of learning device and study result test. The technique of analyzing data used pre-requirement test (validity test, reliability test, different power, difficulty level, normality test, and homogeneity test), N-gain test, and *independent sample t test.*

RESULTS AND DISCUSSION

The result of the research is validity, practicability, and effectiveness of learning device of guided inquiry contained ethnomathematics to improve students' study result.

Validity of Learning Device

Learning device of Guided Inquiry contained ethnomatematics which was used in wide scale trial is tested by validator. The validity result of Guided Inquiry contained ethnomatematics is presented in the Table 1.

Table 1 shows that validity result from experts gained average score 3.41 with valid criteria. This means learning device of Guided Inquiry contained ethnomathematics can be used.

Table 1. Result of Validity of Learning Device of Guided Inquiry contained ethnomatematics

No	Devices	Validity result		
		V_1	V_2	V_3
1	Lesson Plan	3.25	3.50	3.30
2	Syllabus	3.43	3.45	3.50
3	Students' worksheet	3.30	3.50	3.50
4	Learning device	3.35	3.25	3.50
5	Study Result Test	3.43	3.50	3.25
Average		3.35	3.44	3.41
Final average			3.41	
Criteria			Valid	

Learning device which is developed is based on Cirebonese cultures. In feasibility aspect of learning device content, the materials are presented according to established main competence, base competence and indicator. Difficulty level is adapted based on students' progress namely from easier materials to harder material; and materials are presented from elaborating students' knowledge then investigating until students will think scientifically. This is suitable to learning device principle from Depdiknas (2008) which says that development of learning device should begin from easier to understand the difficult one, from concrete to understand the abstract one. In the feasibility aspect of presenting learning device, the materials are presented in sequence and systematically based on learning process beginning from apperception, core activity, until closing. Linguistic aspect of learning device is suitable to understanding level of students. The language use should be effective, interesting and easy to understand, and message is delivered with interesting and communicative language in order to motivate students. From graph aspect, learning device is presented based on Cirebonese cultures. Pictures and illustration are presented with interesting colors so that the delivery of material is suitable to students' daily life. Learning device which is developed can make valid learning device to be used in the harmony of two-dimentional figures and Cirebonese society cultures as in Figure 1.

Figure 1 Sample of Learning device etnomatematic contained Cirebonese cultures.

Effectiveness of Learning Device

The effectiveness of learning device is seen based on analysis of competence of science literacy with science literacy test. The analysis result of final data is gained that experimental class and control class are normal and homogeneous, so that to test hypotheses is with using statistic of independent sample t test. The data is preserved in Table 2.

Table 2. Result of t-test of Average Difference

	Lavene's test		t-test			
	F	Sig	t	df	Sig. (2-tailed)	Average difference
Assumption of similar varians	0.597	0.442	7.794	29	0.000	11.733
Assumption of dissimilar varians			7.463	29	0.452	10.033

Based on Table 2, known that $t_{value} = 7.794$ and significance 0.000. Therefore, it known that $7.794 > 2.032$ or $t_{value} \geq t_{table}$ and $0.000 < 0.005$ or significance score < 0.05, so H_0 refused. So that, the conclusion from the research is namely the average of study result of *guided inquiry* contained *ethnomatematics,* experimental class students are better than control class students. To know the difference of students' study result can be seen at the Table 3.

Table 3. Difference of Student achivement

Class	N	Average
Experiment	30	89.72
Control	30	79.70

Based on Table 3, resulted the average of experimental class 89.72 and control class 79.70. From the result, the average of experimental class is higher than control class. This shows that the result of study of experimental class is better than control class.

The progress of students' study result is gained from the score of *prestest and posttest* with N *gain-test* as in Table 4.

Based on Table 4, the result of N-gain test in experimental class shows 0.73 with high category, while control class shows medium category.

Table 4. Result of N-Gain Test

Class	Average		N-Gain
	Pre-test	Post-test	
Experimental	61.97	89.72	0.73
Control	61.88	79.70	0.47

The analysis of t-test data from the result of difference progress average (N-g*ain*) is gained t_{value} = 7.794 and the significance 0.000. Therefore, it is known that $7.794 > 2032$ $t_{value} \geq t_{table}$ and $0.000 < 0.005$ or significance score < 0.05, so H_0 is refused. So that, the conclusion of this research is progress of students' study result average of experimental class is better than control class.

Table 3 shows that students' study result average of experimental class using *guided inquiry* model contained *ethnomathematics* is higher than control class. The outcome of research is the use of *guided inquiry* model is able to improve students' study result and develop students' character. Other research using *guided inquiry* model was conducted by Novana, Sajidan, and Maridi (2014) which stated that students' cognitive, affective and psycho-motoric learning

achievement in the learning using guided inquiry model based local potential in the material of moss and ferns plants was better than conventional learning. The similar research stated that with *ethnomatematics* was able to improve the concept of mathematics and is able to improve students' literacy skill. By applying *ethnomatematics* which is near to students' daily life, students are able to improve two-dimentional figure concept, besides to improve concept skill, it will improve students' literacy skill significantly.

Other researcher who used *ethnomatematics* module was able to improve the character of loving local culture and to improve the skill of breaking down students' mathematics problems. Other study using inquiry was conducted by Saragih, and Afriati (2012). The study results significant progress on understanding on function graphic concept of trigonometry to students of SMK in Bandung, West Java. This showed that understanding of students' concept on function graphic of trigonometry which is gained with guided discovery approach Software Autograph assistant is higher than students who got usual approach. The research which discussed *ethnomatematics* was also conducted by Rachmawati (2012). This approach resulted the significant improvement on students' cognitive study result in primary school in Sidoarjo. This showed that the use of *ethnomatematics* is able to improve students' study result than students who use conventional learning.

Other researcher who used *ethnomatematics conducted by* Kaselin, Sukestiyarno, and Waluya, (2016). This study resulted in an average value of 7.67 experimental class better than the average control class 6.71 and an increase in the ability of mathematical communication skills by 91.4%. Research conducted by previous authors has a connectedness with this research that is same discussing in ethnomatematics but there are differences in the material discussed. In this study the authors only focus on the topic of geometry.

Based on the result of N-*Gain*, the progress of students' study result of experimental class was at high category; meanwhile control class was at medium category. Where experimental class used learning device *guided inquiry* contained *ethnomatematics* which was developed higher than control class which used learning device from the government. This showed that by applying learning device *guided inquiry* contained *ethnomatematics* in learning activity of class IV, affecting rises of students' study result. This is suitable to Wirasti opinion (2014) which used inquiry method at the material of Indonesia Independence celebration; which was able to improve students' study result with average score of guided inquiry learning 74.54.

CONCLUSION

Based on the result of the research results, it can be concluded that the learning device of *Guided Inquiry* contained *Ethnomatematics* which was developed has fulfilled valid criteria with score in average 3.41.

Learning device of *Guided Inquiry* contained *Ethnomatematics* which was developed has fulfilled practical criteria with score of teachers' response 63.3% and students' response 75%.

The effectiveness of learning device which was developed can improve students' study result showed with the improvement of study result of experimental class which is higher than control class and the average of classical students' study result of experimental class which is better than control class.

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