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A Development of Teaching resources: Based on West Java Ethnomathematics for Grade 7 Middle School students

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Abstract

This study aims to develop teaching resources based on West Java ethnomathematics, while the teaching resources developed are learning modules. The method used in this study is R&D method using the ADDIE development steps (Analysis, Design, Development, Implementation and Evaluation). The finished product is validated by 2 experts. each expert is given an assessment sheet regarding the learning module. The first expert assesses the suitability of the material used in the module, while the second expert assesses the feasibility of the module from the appearance aspect. The results of the validation by the first expert stated that the module was included in the "Very good" criteria with a percentage of 91%. Similar results by the second expert stated that the module was included in the "Very good" criteria with a percentage of 88.86%. After the module is declared valid, the learning module is used by the teacher in learning activities. Tests are given to students at the beginning and the end of learning activities to assess their learning achievement. ased on the results of the Independent Sample T-test with a confidence level of 95% and = 5%, the t-value is 3.172 and the t-table is 2.00324. These results indicate that the value of t> t-table, it means that the increase in learning achievement of the experimental class is higher than the control class. Finally, it can be concluded that the use of the teaching resources is effective in improving student achievement.

Keywords: *Teaching resources, Ethnomathematics, learning module*

A. Introduction

Mathematics is an important part of science and technology, needed by everyone as a means of thinking, because it can provide benefits and convenience in carrying out daily activities. Mathematics is one of the subjects that occupies an important role in education. However, many students think that mathematics is difficult. This assumption resulted in students having low mathematics learning achievement. The average national exam score on mathematics subjects in West Java province is 46.14, indicating student learning achievement is still relatively low. Similar low results were also found in the Majalengka district with an average national exam score of 44.10 for mathematics (Puspendik, 2019).

Low learning achievement is caused by several factors such as the lack of variety of learning methods used, ineffective learning methods or teaching materials used, and abstract mathematics learning and less associated with culture or everyday phenomena, causing students to assume that mathematics is difficult. Supriadi revealed that the most problematic element in learning mathematics is the textbook (Aini, 2017).

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The teacher is the party who usually develops textbooks. Therefore, one of the important elements in the learning process in formal education is a teacher (Pajares, 1992; Tłuściak-Deliowska, 2017). The teacher is the subject who plans and manages all the processes of learning in the classroom. When the teacher can make a good lesson plan, then learning objectives that are expected to be achieved. To make a lesson plan, it is necessary the selection of models or learning approaches that are in accordance with the characteristics of students (Rhosyida & Jailani, 2014), so that learning becomes effective. This learning model and approach will later be applied as a characteristic of a textbook.

The facts on the ground still show that the learning process is not as expected. Several studies (Fitrianawati & Hartono, 2016; Sulistyani & Retnawati, 2015; Trisnadati, 2018) mentions that some teachers still teach using conventional learning. the learning process in the classroom runs only in one direction which causes students to become passive. Conventional learning that is only teacher-centered hinders student involvement in the learning process in the classroom Students only write what the teacher writes on the blackboard and examples of questions that the teacher gives. If students are given questions of different types, they will have difficulty solving them. Apart from choosing appropriate learning model, when making lesson plans it is also necessary to pay attention to the use of teaching resources that can meet student learning needs. One of the efforts is to bring students closer to the culture they know. If learning is delivered in a culture that he understands and knows, then learning will be much easier to do. Therefore, the teaching resources developed should prioritize things that are already familiar to students, and nothing is more familiar than involving the culture that they live in on a daily basis.

Regulation of the Minister of Education and Culture number 65 of 2013 concerning process standards, which regulates the planning of the learning process which requires educators in education units to develop lesson plans. One of the elements of lesson plans is learning resources. Thus, teachers are expected to develop teaching materials as a source of learning. Developing innovative and fun teaching materials is needed in improving students' abilities when learning. Teaching materials as a tool to convey information, are expected to facilitate the learning process more effectively. By using teaching materials in learning mathematics, students are expected to more easily understand mathematical concepts. In order for students to easily understand mathematical concepts, a teaching material needs to be linked to everyday phenomena and culture. The National Council of Teacher of Mathematics (NCTM) also provides recommendations on the importance of the connection between mathematics and students' personal lives and the culture in which students live (Dahlan & Permatasari, 2018). The relationship between mathematics and culture is commonly referred to as ethnomathematics.

Ethnomathematics was first introduced in 1977 by D'Ambrosio, a Brazilian mathematician. according to D'Ambrosio (1985) ethnomathematics is the study of mathematics that takes into account the cultural considerations in which mathematics emerges by understanding the reasoning and mathematical systems they use. Ethnomathematical studies in mathematics learning cover all fields: architecture, weaving, sewing, agriculture, traditional dance, batik cloth, kinship, ornament, and spiritual and religious practices often in harmony with patterns that occur in nature or ordering systems of abstract ideas. Meanwhile, according to Barton (1999), ethnomathematics includes mathematical ideas, thoughts and practices developed by all cultures. Ethnomathematics can also be considered as a program that aims to study how students understand, articulate, process, and ultimately use mathematical ideas, concepts, and practices that can solve problems related to their daily activities. According to Wahyuni, ethnomathematics is a form of mathematics that is influenced or based on culture (Rahmawati,

2017). Connecting the subject of mathematics to a phenomenon or culture will encourage students to make connections between the newly taught knowledge and its application in daily activities. This relationship can finally be used by students in understanding mathematics more easily. In addition, through the application of ethnomathematics, it is also hoped that later students can better understand their culture. so that educators will find it easier to instill cultural values that are the nation's character from an early age to students.

One of the teaching resources that can be developed by the teacher is the module. A module is a book that written with the aim that students can learn independently without or with teacher guidance (Depdiknas, 2008). Modules are teaching materials that are arranged in a systematic and interesting manner that includes material content, methods, and evaluations which can be used independently. According to Prastowo (2011) learning by using the module aims to (1) students are able to learn independently or with minimal teacher assistance, (2) the teacher's role does not dominate and does not authoritarian in learning, (3) train students' honesty, (4) accommodate various levels and speeds of student learning, and (5) students can measure their own level of mastery of the material being studied. The presentation of the material in the module is arranged systematically and completely which makes it easy for students to learn independent study and manage student study time. The module is a type of planned learning activity unit, designed to assist individual students in achieving their learning goals (Sukiman, 2012). In teaching materials in the form of modules there is feedback and follow-up that students must do after studying.

Learning using modules can also provide opportunities for students to build their own knowledge. In this case, through the use of the module students can be directed to focus their attention on the problem and look for alternative solutions, both individually and in groups. Thus the module will be effective if it is combined with problem-based learning. Problem-based learning is a learning process that involves students in the investigation of choices which enables them to interpret and explain real-world phenomena and build an understanding of those phenomena (Rusman, 2014). The issue raised relates to students' daily lives so that students feel interested in solving them.

Previous study suggests that teaching materials based on the sociocultural context of the city of Cirebon are feasible and effective (Scientific, 2018). Siti Mardiah (2018) suggests that the ethnomathematics-based mathematics learning module is very attractive to teachers and ready to be used as teaching materials. Aritsya & Hamidah (2018), Fadilah & Marsigit (2017) state that ethnomathematics-based teaching materials are effective in improving student achievement. Elma Purnama (2017) stated that the handout through an ethnomathematical approach was valid, practical and interesting.

Based on the description of the problems that have been stated previously, the development of teaching materials in the form of modules needs to be done to help students improve their learning achievement. However, the content of the module must also be in line with the principles of meaningful learning and be able to facilitate students to be actively involved in learning. The learning module by utilizing the ethnomathematics of West Java can be used as an alternative to overcome the problems that have been stated previously. Therefore, the aims of this study are to develop teaching resources based on West Java ethnomathematics and to find out the effectiveness of its use in learning activities.

B. Methods

The method used in this study is research and development (R&D) using the ADDIE model development steps. Richey & Klein (Winarso & Wahid, 2020) stated "development research as a systematic study of the design, development, and evaluation of programs, processes and learning products that need to meet validity, practicality, and effectiveness criteria". Mulyatiningsih (2012) states that the ADDIE model stands for Analysis, Design, Development, Implementation and Evaluation developed by Dick and Carry.

At the analysis stage, the researcher conducts a needs analysis, analysis of curriculum and, analysis of student characteristics. Needs analysis is done by analyzing potential and problems which is used as the basis for the development of the module. Curriculum analysis is done by analyzing basic competencies to understand the depth and breadth of the material. Analysis of student characteristics was carried out by observation when students are doing the learning process and looking for information about students directly specifically by discussing with the teacher.

The design stage is compiling a draft of teaching materials in the form of a module, compiling an outline of the presentation of the material, collection of references, and preparation of research instruments. The instrument is prepared by taking into account the aspects of content feasibility, presentation aspects, language aspects and appearance aspects. The instruments arranged in the form of questionnaires and learning outcomes tests. Questionnaire sheet for material experts and media experts. Learning outcomes test is used to measure the level of students' understanding after learning using the developed module.

The development stage includes the preparation of the material as a whole and designing materials that are adapted to the ethnomathematics of West Java. The modules that have been developed are then consulted with supervisors to be validated by material expert validators and media experts. Validation is carried out to determine the feasibility of the module developed and inputs from material experts and media experts serve as the basis for improving the module before being tested.

The implementation phase is carried out by carrying out classroom learning with modules that have been developed. When conducting a trial, the researcher who acts as a teacher invites observers to observe the learning activities. At the end of the meeting the students took the learning outcomes test to determine the level of students' understanding of the material being taught. The evaluation stage, analyzing the test scores of learning outcomes. Learning outcomes test scores are used to determine the effectiveness of the module.

In this study, data collection techniques were in the form of questionnaires and tests. The instrument in this study was used as an assessment tool to obtain data about the validity and effectiveness of the module developed. Instruments to measure validity using a material expert assessment questionnaire sheet and media expert. The material expert and media expert assessment questionnaire use 5 alternative answers, namely Poor (P), Not Good (NG), Fair Enough (FE), Good (G), and Very Good (VG). Instruments to measure the effectiveness of using learning outcomes test questions consisting of 20 multiple choice questions. The learning outcomes test is carried out after learning using the developed module.

The object of this research is the students of MTs Prakarya PUI Panjalin. Class 7A students will be used as the experimental class and class 7B students as the control class. the assessment sheet from the first expert (material) and the second expert (media) will be analyzed based on the percentage score of each validator calculated by the formula:

$$\text{Percentage} = \frac{\text{total score obtained}}{\text{ideal score}} \times 100\%$$

The percentage obtained is then adjusted to the assessment criteria. The assessment criteria used are as follows:

Table 1. Assessment Criteria

Percentage (%)	Criteria
0 – 20	Poor
21 – 40	Not good
41 – 60	Fair enough
61 – 80	Good
81 – 100	Very good

The learning achievement test was analyzed based on the N-Gain test, prerequisite test (normality test & homogeneity test) and hypothesis testing, namely the independent sample t-test. The hypotheses proposed are as follows: the average value of the experimental class is the same as the average value of the control class (H0) and the average value of the experimental class is higher than the average value of the control class (Ha). If the value of t-value > t-table then H0 is rejected and Ha is accepted. If t-value < t-table then Ha is rejected and H0 is accepted.

C. Findings and Discussion

This study produces a teaching resources based on West Java ethnomathematics. This teaching resources was developed with the steps of developing the ADDIE model, the steps are: (1) Analysis, (2) Design, (3) Development, (4) Implementation, 5) Evaluation. The findings obtained are as follows:

Analysis stage, at this stage the researcher analyzes student needs such as the curriculum used is the 2013 curriculum, besides that the researcher also analyzes the syllabus, mathematics books as references, Basic Competencies and Achievement Indicators and learning objectives.

Design stage, at this stage a design of teaching resources is produced. This West Java ethnomathematics-based teaching resources is designed with a cover format, table of contents, basic competencies and achievement indicators, instructions for use, concept maps, supporting information, materials, student activities, practice questions, summaries, evaluations, follow-up and answer keys.

In the Development phase, the teaching resources that the researchers developed were West Java ethnomathematics-based teaching resources in the form of modules. This teaching resources is designed using Microsoft word 16 with A4 paper size (21 cm × 29.7 cm). The font used is calibry (body) with a font size of 11 and a spacing of 1.15. After the teaching materials are made, the teaching resources are validated by experts (expert judgment) consisting of media experts and material experts. Media experts provide an assessment by filling out an assessment sheet based on West Java ethnomathematics which consists of six aspects of the assessment, namely aspects of format, organization, attractiveness, font shape and size, empty space (space) and consistency. Based on the validation results from media experts, a percentage of 91% was obtained with the "Very good" criteria. The results of the media expert's assessment can be seen in the following picture.

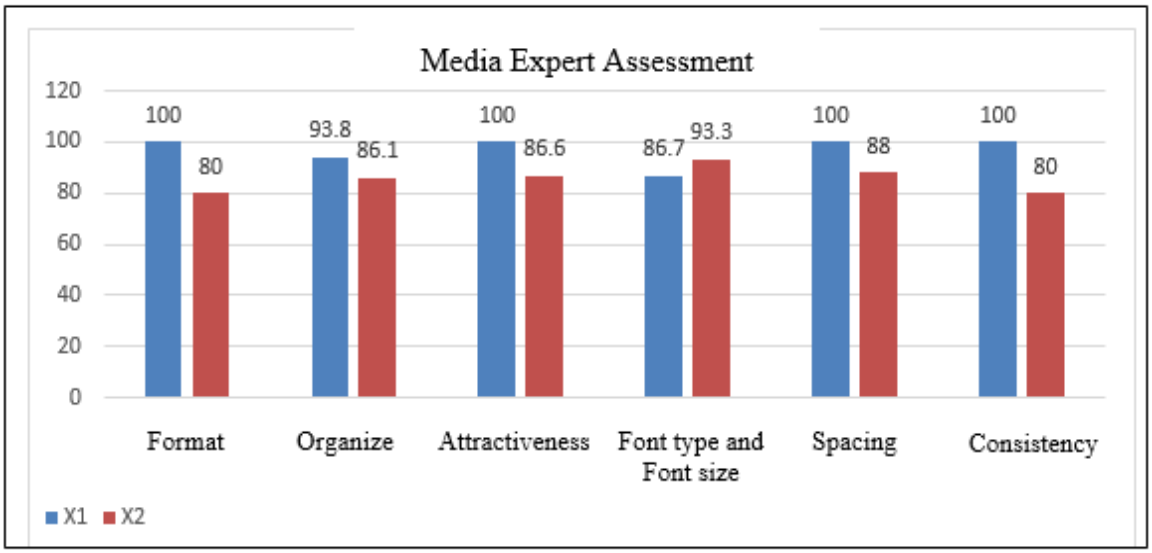


Figure 1. Assessment of Media Expert

The material expert provides an assessment by filling out an assessment instrument sheet based on West Java ethnomathematics which consists of three aspects of the assessment, namely aspects of content feasibility, presentation feasibility and language feasibility. Based on the results of material expert validation, a percentage of 88.86% was obtained with the "Very good" criteria. The results of the material expert's assessment can be seen in the following picture.

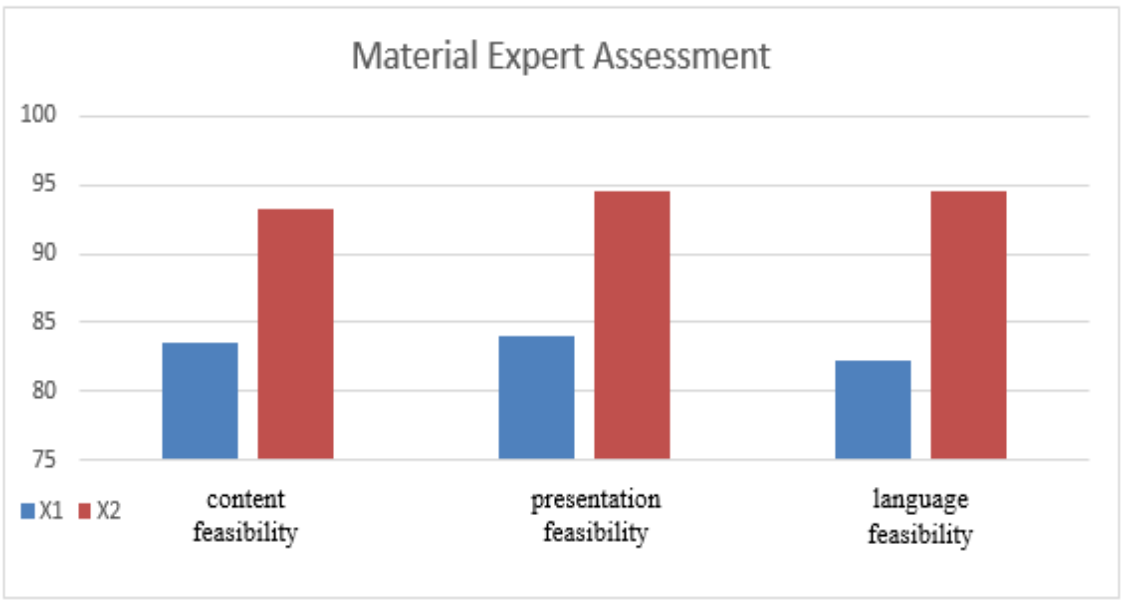
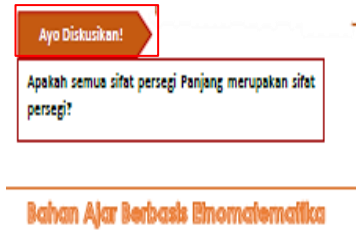
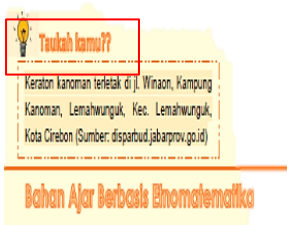
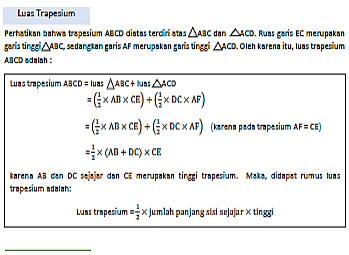
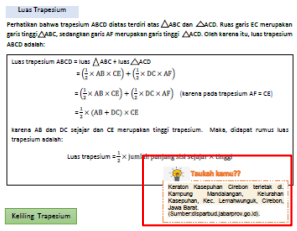
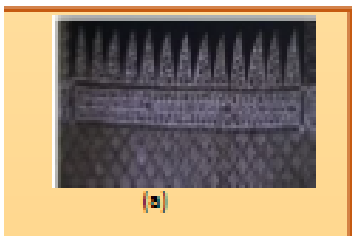


Figure 2. Assessment of Material Expert

Based on suggestions from the expert, further revisions were made to the West Java ethnomathematics-based teaching materials as follows:

Table 2. Revision of Teaching Materials

Explanation	Before revison	After Revision
Let's discuss it is replaced with did you know which contains the location of the Cirebon Kanoman Palace		
Added "did you know" which contains the location of Hasan Maulani's traditional house		
Added "did you know" which contains the location of the Cirebon kasepuhan palace		
Every photo or image is added source		

Implementation stage, after the West Java ethnomathematics-based teaching materials were validated by experts and declared feasible, the teaching materials were then implemented at MTs Prakarya PUI Panjalin. Class 7A students as the experimental class and class 7B students as the control class.

Evaluation stage, before testing the hypothesis, the researcher conducted a prerequisite test. The normality test was carried out using the SPSS 17.0 program. The results of the normality test can be seen in the following table.

Table 3. Test of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Class	Statistic	Df	Sig.	Statistic	Df	Sig.
Data	Experiment	.139	28	.176	.959	28	.331
	Control	.149	30	.089	.956	30	.240

a. Lilliefors Significance Correction

From Table 3 above, for the experimental class, a significance value of 0.176 was obtained and for the control class it was 0.089, thus, both data > 0.05, which means that the data is normally distributed.

Homogeneity test was carried out using the SPSS 17.0 program. The results of the homogeneity test can be seen in the following table.

Table 3. Test Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
Data	Based on Mean	.143	1	56	.706
	Based on Median	.154	1	56	.697
	Based on Median and with adjusted df	.154	1	54.593	.697
	Based on trimmed mean	.178	1	56	.675

From Table 3 above, the significance value is 0.706, data > 0.05, which means the data is homogeneous. independent sample t-test was conducted using the SPSS 17.0 program. The results of the independent sample t-test can be seen in the following table.

Table 4. Independent Sample Test

	F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Equal variances assumed	.143	.706	3.172	56	.002	.15138	.04772	.05578	.24697
Equal variances not assumed			3.171	55.664	.002	.15138	.04773	.05574	.24701

Based on Table 4, the results of the independent sample t-test show that the significance value is 0.002 and the t-count value is 3.172 and the t-table value is 2.00324. Significance value > 0.05 and the t-value > t-table so that H0 is rejected, meaning that the experimental class average is higher than the control class average. In addition, the results of the student response questionnaire obtained a percentage of 76.02% with the "Good" category. In the content aspect, the percentage is 77.8%, the presentation aspect is 78.4%, the language aspect is 73.2%, the cultural aspect is 75.4%, and the practical aspect is 75.4%. To be clear, the results of the student response questionnaire can be seen in the following figure.

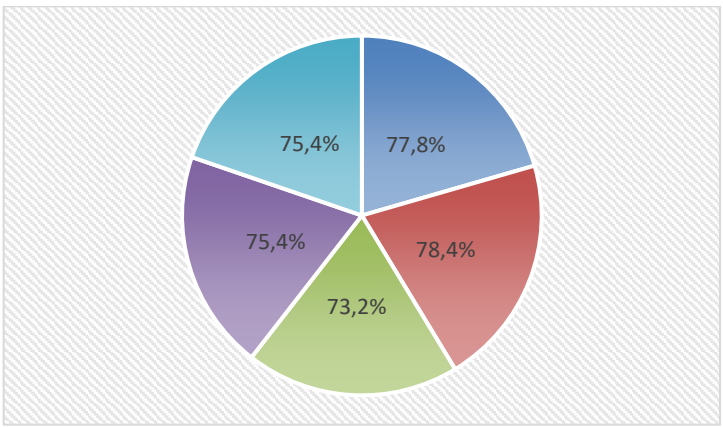


Figure 3. Student Response

D. Conclusion

West Java ethnomathematics-based teaching resources were developed using research and development (R&D) methods using the ADDIE model development steps (Analysis, Design, Development, Implementation, Evaluation). The results of the validation of media experts obtained a percentage of 91% and material experts obtained a percentage of 88.86% so that the teaching materials were said to be "Very Good". The results of the Independent Sample T-test with a 95% confidence level and = 5% obtained tcount of 3.172 and t-table value of 2.00324. These results indicate that t-value > t-table which means the average value of the experimental class is higher than the average value of the control class. In addition, the results of the student response questionnaire obtained a percentage of 76.02% with the "Good" category. So it can be concluded that the use of teaching materials based on West Java ethnomathematics is effective for improving student achievement.

References

Aini, E. P. (2017). *Pengembangan Handout Melalui Pendekatan Etnomatematika Berbasis Budaya Lokal Pada Materi Bangun Datar Kelas VII SMP 20 Bandar Lampung.* Lampung: Universitas Islam Negeri Raden Intan Lampung.

Barton, B. (1999). Ethnomathematics and philosophy. *ZDM*, 31(2), 54-58. https://doi.org/10.1007/s11858-999-0009-7

Dahlan, J. A., & Permatasari, R. (2018). Development of Instructional Materials Based on Ethnomathematic in Mathematics Learning in Junior High School. *JNPM (Jurnal Nasional Pendidikan Matematika)*, *2*(1), 133-150.

D'Ambrosio, U. (1985). Ethnomathematics and its place in the history and pedagogy of mathematics. *For the learning of Mathematics*, 5(1), 44-48.

Depdiknas. (2008). *Panduan pengembangan bahan ajar*. Jakarta: Author.

Fitrianawati, M., & Hartono, H. (2016). Perbandingan keefektifan PBL berseting TGT dan GI ditinjau dari prestasi belajar, kemampuan berpikir kreatif dan toleransi. *Jurnal Riset Pendidikan Matematika*, 3(1), 55-65. doi: https://doi.org/10.21831/jrpm.v3i1.9684

Ilmiah, D. M. (2018). *Pengembangan Bahan Ajar Berbasis Sosiokultural Kota Cirebon Dalam Pemahaman Matematika Siswa.* Cirebon: IAIN Syekh Nurjati Cirebon.

Imswatama, A., & Lukman, H. S. (2018). Penerapan Bahan Ajar Matematika Berbasis Etnomatematika terhadap Kemampuan Pemecahan Masalah Matematis Siswa. *Prosiding SENAMKU*, *1*, 92-100.

Mardiah, S. (2018). *Pengembangan Modul Pembelajaran Matematika Berbasis Etnomatematika.* Lampung: UIN Raden Intan Lampung.

Mulyatiningsih, E. (2012). *Riset terapan bidang pendidikan dan teknik*. Yogyakarta: UNY Press.

Pajares, M. F. (1992). Teachers' beliefs and educational research: Cleaning up a messy consruct. *Review of Educational Research*, 62(3), 307-332. doi: https://doi.org/10.3102/00346543062003307

Permendikbud. (t.t). *bnsp.indonesia.org*. Retrieved from https://bsnp-indonesia.org/wp-content/uploads/2009/06/03.-A.-Salinan-Permendikbud-No.-65-th-2013-ttg-Standar-Proses.pdf

Prastowo, Andi. (2011). Panduan Keratif Membuat Bahan Ajar Inovatif. Yogyakarta: Diva Press.

Puspendik. (2019). *hasilun.puspendik.kemendikbud.go.id*. Retrieved from kemendigbud.go.id: https://hasilun.puspendik.kemdikbud.go.id/tmp_downloads/CAPAIAN%20NILAI%20UJIAN%20NASIONAL%20SMP%20TAHUN%20AJARAN%202018-2019_%20.xlsx

Rahmawati, F. D. (2017). Pengembangan Bahan Ajar Berbasis Etnomatematika Untuk Meningkatkan Prestasi Dan Motivasi Belajar Siswa SMP. *Jurnal Pendidikan Matematika-S1*, *6*(6), 69-76.

Rhosyida, N., & Jailani, J. (2014). Pengembangan modul matematika smk bidang seni, kerajinan, dan pariwisata berbasis open-ended problem sebagai implementasi KTSP. *Jurnal Riset Pendidikan Matematika*, 1(1), 35-47. doi: https://doi.org/10.21831/jrpm.v1i1.2662

Rusman, R. (2014). *Model-model pembelajaran mengembangkan profesionalisme guru*. Jakarta: Rajawali Pers.

Sukiman, S. (2012). *Pengembangan Media Pembelajaran*. Yogyakarta: Pedagogia.

Sulistyani, N., & Retnawati, H. (2015). Pengembangan perangkat pembelajaran bangun ruang di SMP dengan pendekatan problem-based learning. *Jurnal Riset Pendidikan Matematika*, 2(2), 197 - 210. doi: https://doi.org/10.21831/jrpm.v2i2.7334

Tłuściak-Deliowska, A. (2017). Unity of purpose is not enough? The importance of teachers collaboration in school: Some reflections based on a case study. Journal of Modern Science, 32(1), 45-62. Retrieved from http://cejsh.icm.edu.pl/cejsh/element/bwmeta1.element.desklight-8d60ee46-d807-4edd-9adf-5bd6f25a67e9/c/45_pdfsam_kwartalnik_1_32_2017__5.05.pdf

Trisnadati, I. (2018). Komparasi pendekatan matematika realistik dengan model PBL dan PjBL ditinjau dari kemampuan interpersonal, berfikir kritis, dan prestasi belajar. *Pythagoras: Jurnal Pendidikan Matematika*, 13(1), 99-109. doi: https://doi.org/10.21831/pg.v13i1.21219

Winarso, W., & Wahid, S. (2020). Development of Mathematics Teaching Device Integrated with Quranic Values: Issues, Challenges, and Implementation Model. *International Journal of Learning, Teaching and Educational Research*, 95-117. https://doi.org/10.26803/ijlter.19.1.6