Development of teaching materials of elementary school student with a scientific approach characterized by ethnomathematics

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Abstract. The aim of this study was to find out how is development of teaching materials of elementary school students with a scientific approach characterized by ethnomathematics. This research was research and development with 4D research model namely, define, design, develop, and disseminate. Sampling of this research was students at Public Primary School 1 Terpadu Karang Kemiri and Public Primary School 2 Karang Kemiri. The results of the assessment were: assessment of content experts was 80.78% and categorized as very feasible, media experts’ score was 65.47%, categorized as feasible, and cultural experts’ score was 80.00%, categorized as very feasible. In the pilot phase of a small group, it was gained an average of 3.18 with a good category. The pilot of field test was gained an average of 3.34 with a very good category. In conclusion, the development of teaching materials of elementary school students with a scientific approach characterized by ethnomathematics was categorized as very feasible and attractive to use in teaching at elementary level to the plane material.

1. Introduction
The latest of Indonesian curriculum, Curriculum 2013, requires creativity of teachers to prepare teaching materials that are innovative, varied, exciting, contextual, and the appropriate to the level of the students’ needs. Many research showed that learning in context make mathematics more meaningful to students [1]. The curriculum of 2013 uses a scientific approach in which learning is designed on student oriented to encourage motivation, interests, creativity, initiative, inspiration, independence and willingness to learn. The steps of this approach include observing, asking, gathering information, reasoning and communicating [2]. The scientific approach is often referred to the environmental approach. Local cultural approach can be developed in environmental approach. However, the local culture or the culture of Indonedia is constantly eroded by globalization. Hence, using cultural approach in learning is appropriate for cultural expansion. It is also in line with Curriculum 2013, thematic integrated, at primary school level. Thematic integrated learning is applied in primary school by combining a variety of subjects that have the same theme. Learning is the most basic activities in a process of education, especially in formal education. Learning is not just demanding experience, but it is a process [3] in which there are interactions between educators and learners with a specific purpose. Mathematics is a universal science that is fundamental to modern technological development such as development of mathematics in numeral theory, geometry, algebra, analysis, probability theory, and discrete mathematics [4]. Learning mathematics is a
mathematics learning process in which there are interactions between educators and learners with mathematics learning objectives. Mathematics is a subject that is structured, organized, and tiered, meaning that the link between the material [5].

Education and culture are a part that can not be separated, both are mutually supportive and reinforcing. Culture became the philosophical basis of education, while education became the main guardian of cultures because the role of education is to shape a people's culture. Education and culture are somethings that are inevitable in daily life, because culture is a unified whole, complete, and applicable in a society, and education is a fundamental requirement for every individual in the community [6]. It is also in line with Curriculum 2013 demanding quality of learning activities. Quality learning is a learning that is able to engage learners cognitively and emotionally [2]. In order to achieve quality learning, there are several things that need to be considered and one of them is that a source of learning or teaching materials.

Culture contains the elements of mathematics often called ethnomathematics. The scope of ethnomathematics in mathematics education emphasizes on the analysis of the effect of socio-cultural factors in learning activities and the development of mathematics itself. Mathematics is a cultural product. Every culture and subculture develop their own math. Math is considered to have a broad scope, as it contains all human activities. Mathematics as a product of culture has a history and the development of mathematics is not linear [7].

Learning mathematics that carries the local knowledge, also known as ethnomathematics [8]. Ethnomathematics is a mathematics learning approach that builds upon students' prior knowledge, background, environment role in terms of content and method, and the past experience and the current environment [9]. In short, culture that influence mathematical forms can be referred to ethnomathematics [10]. “Ethnomathematics offers not only a broader view of mathematics, embracing practices and methods related to a variety of cultural environments, but also a more comprehensive, contextualizing perception of the process of generating, organizing, transmitting, and disseminating mathematics” [11]. Many teachers in the United States implemented of ethnomathematics in their classroom [12]. Research showed that students who were taught by an ethnomathematical curriculum perform better on mathematics tests [13]. Therefore, ethnomathematics contribute to the society and school mathematics for the students and learning [14]. Ethnomathematics is good to apply to scientific approach in curricula 2013 because learning with local culture will make learners gain more meaningful learning for culture as an example in learning process itself frequently met by students in daily life. Local culture, especially in Indonesia from Sabang to Merauke is extremely diverse, among cultures that exist in Indonesia, one of which is the culture of East OKU is often referred to the culture of Komering. Komering is a tribal group who come from East OKU. Komering tribe in East OKU is divided into several parts which are Komering Betung, Komering Muncak Kabau, Komering Rasuan etc. East Komering Ulu is one of 15 districts / cities in South Sumatra province. The culture of East OKU varies and consists of elements of plane.

Therefore, this study aimed to develop plane module of elementary school students with a scientific approach characterized by ethnomathematics as well as to find out feasibility and students’ responses on attractiveness of plane module of elementary school students with scientific approach characterized by ethnomathematics

2. Research method
The method used in this study was a research and development a new products or enhance existing products, in this case teaching materials for elementary school students with a scientific approach characterized by ethnomathematics. Development model used was the 4D development, namely define, design, develop, and disseminate [15] and design models tailored to the needs of research. Techniques of data collecting were interviews, document, expert validation, and survey. Instruments of this study were validation sheet and Questioners/students’ response sheets. Data were analyzed using descriptive qualitative and descriptive quantitative.
3. Results and discussion
Results of the first study were a development of teaching materials for elementary school students with a scientific approach characterized by ethnomathematics. This text printed in the form of module characterized ethnomathematics on plane material and the module was also equipped with sample questions and other evaluation materials. This material development adapted the curriculum 2013. This module used a paper size based on the ISQ ie A4, A5 and B5. Therefore, researchers used B5 size paper (18.2 cm × 25.7 cm). The module consists of 69 pages namely cover, preface, table of contents, concept maps, features, modules, three lessons, lesson 1: the introductory of form and name of Plane, lesson 2: kinds of plane, lesson 3: identify the area and perimeter of plane and measure angles of plane, practice questions in each lesson, glossary, summaries, evaluations, key answers, and references. This stage was supported by Microsoft Word 2007. While, phase collection of material derived from several sources, such as reference books, educational websites, and papers. After materials collecting, the development was conducted, namely:

3.1. Production prototype
After prototype, the researcher conducted an prior evaluation step in which review the module that are characterized by ethnomathematics in the district of East OKU to ensure that the module was ready to the stage of private evaluation. The module was evaluated by peers.

3.1.1. Evaluation phase. Evaluation phase was the final step in the development of teaching materials (modules) of math characterized ethnomathematics in East OKU District prior to the validator.
1) Self Evaluation, it is self-assessment with the further stage of the internal evaluation phase of the math module prototype of plane material characterized ethnomathematics in East OKU District.
2) Expert review, it is the stage of validating. Validation of experts conducted by three experts, namely; content experts, a culture expert and media experts to look at the feasibility or validity as well as the attractiveness before tested to students.
3) One-by-one. This was conducted with two students of Public Primary School 1 Terpadu Karang Kemiri and one student of Public Primary School 2 Karang Kemiri.
4) Small Group, this stage gave to four students of grade four at Public Primary School 1 Terpadu Karang Kemiri and two student of grade four at Public Primary School 2 Karang Kemiri. At this stage, the module was tried out by distributing the questioner to the students to evaluate the module.
5) Field Test, it was conducted in the classroom, 14 fourth grade students Public Primary School 1 Terpadu Karang Kemiri and 7 students of Public Primary School 2 Karang Kemiri, this phase aimed to pilot and determine students' responses to the development of plane module characterized by ethnomathematics.
Data of validation of teaching materials characterized by ethnomathematics in East OKU were obtained from 7 validators, which is 3 professors, 3 educators and one tribe leader of East OKU. Data were obtained in the form of quantitative and qualitative data. The quantitative data in the form of a questionnaire assessment and qualitative data in the form of comments or suggestions.
Quantitative data were analyzed by calculating the average of questionnaire in form of the rating scale, 1,2,3, and 4. Then the score was referred to interval termination of feasibility and attractiveness of prototype, therefore validator criteria against plane modules was obtained. Qualitative data in the form of comments or suggestions were used to make improvements to the prototype in detail. Based on research was conducted the plane modules characterized by ethnomathematics that have been developed were eligible and interesting to be used in learning process based on expert validation. The validation score could be seen on figure 1. While, results of students’ responses that was stage one-by-one conducted prior to a small group the average of all aspects of the attractiveness of the test were 3.
Information:

Figure 1: Percentage of ideals of teaching materials.

From the results of the analysis of questionnaire conducted in small groups with 6 respondents with different abilities, the attractiveness test of the module was 3.18 with the category of interesting. Results of the analysis of questionnaire conducted in small groups with 21 respondents with different abilities, demonstrate attractiveness test of module was 3.34 with the category very interesting.

The prototype result of the development has some advantages: 1) provides greater insight to students, both in the mathematics and its relation to the plane material and culture in East OKU District, 2) makes learning interesting, 3) provides elements of the culture of East OKU, exercises, knowledge of other languages, the discussion of the information, in addition to learning mathematics also include Arts and crafts lesson in which students can practice techniques of collage so that they do not feel bored, 4) builds nationalism, and knowledge and love for the local culture.

Previous study showed that the ethnomathematical curriculum have benefits for student learning because students are aware of mathematics as a living and growing discipline and they found mathematics in their own culture [16]. The mathematical experiences from the student’s culture are used to understand how mathematical ideas are formulated and applied [1]. Another study showed other advantages of employing ethnomathematics in learning namely reducing the negative assumption about mathematics, illustrating the intellectual development of numerous cultures and helping students to articulate, relate and interpret several situations [17].

4. Conclusions

The development of teaching materials of elementary school students with a scientific approach characterized by ethnomathematics was conducted in four steps namely, define, design, develop, and disseminate. The module consists of a cover, preface, table of contents, concept maps, features, modules, three lessons. It could be concluded that the development of teaching materials of elementary school students with a scientific approach characterized by ethnomathematics on the material of plane categorized as very feasible and attractive to use in teaching at elementary level. The development of teaching material caturized by ethnomathematics could be applied to another level of education because of its advantages.

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