Improving student's understanding of mathematics through ethnomathematics

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Abstract. The purpose of this study was to determine the influence of ethnomathematics and cognitive style on the ability of understanding mathematics. This research is quasi-experiment with the sample of Class X Student of SMA N 4 Rejang Lebong. The instrument of this research is a test of mathematical understanding ability. The result of this research is the linear influence of students' cognitive style as covariate toward the ability of understanding mathematics; The students' understanding of math ability taught by a contextual learning is higher than that of students conventionally taught after controlling the student's cognitive style. The ability of mathematical understanding of students who are learning oriented ethnomathematics higher than students who learn is not ethnomathematical oriented after controlling the cognitive style of students.

1. Introduction
Mathematics is a compulsory subject for students at the formal education level from elementary to high school level and even universities. This, proves that mathematics has an important part in everyday life [1, 2]. Like the Fruedental opinion that mathematics is a human activity [3, 4]. When these thoughts develop in students, they combine representations and procedures into their cognitive systems [5]. A process has occurred in the context of socially constructed activities [6]. Mathematical skills learned by students in schools are reflected through their cognitive structures [7]. This is a combination of prior knowledge and skills. Like activities involving numbers, geometry patterns, counts and so on are considered as applications of mathematical knowledge involving local culture, better known as ethnomathematics [8].

Ethnomathematics is mathematics in a culture [9]. These are habits of human behavior in their environment, such as the behavior of urban or rural community groups, work groups, professional classes, students in age groups, indigenous communities, and certain other groups [10]. By applying ethnomathematics, it can improve students' mathematical abilities to the maximum [11-13]. This is because during the learning process students are given problems or problems that are close to students' minds, and are related to their daily culture [12]. For example counting, retrieving data, processing data and interpreting data.

Mathematical understanding is a basic competence in mathematics. This includes the ability to absorb a material, remember the formula and mathematical concepts and apply them in simple cases or in similar cases, estimate the truth of a statement, and apply the formula in the problem solving theorem [7, 14].
Ethnomathematics learning aims to reduce rote learning habits. According to Heris Hendriana, all this time students tend to memorize mathematical concepts, often by repeating the definition given by the teacher or written in the book, without trying to understand the intent and contents [14]. This results in students not learning meaningfully [15], and students' mathematical abilities are low [6].

However, when reviewed the low level of mathematical understanding ability, more is due to the learning of school mathematics presented structurally [16]. This has an impact on students' complexity in doing problem solving, communication, reasoning and mathematical connections [7]. Thus, students feel mathematics is far from their lives. Students experience errors in applying mathematics formally and informally.

The previous description suggests that learning mathematics is more meaningful. Therefore, mathematics learning must be close to students' lives. According to Prabawati ethnomathematics can be used as a source of learning in mathematics learning, increase students' insight into the existence of mathematics in one of the cultural elements they have, increase motivation in learning and facilitate students in linking concepts learned with real-world situations [13]. Thus, this paper discusses the enhancement of the ability to understand mathematics through ethnomathematics.

2. Method
The research is quasi-experiment. We had implement ethnomathematics learning in math classes. In the implementation, we employed a 2 × 2 factorial experimental design. The research sample was Class X Student of SMA N 4 Rejang Lebong. The sample was selected by the intact group technique The instrument of this research is a test of mathematical understanding ability. The learning model included realistic mathematics and conventional. The approach of mathematics materials included ethnomathematics and non-ethnomathematics. Data collection was carried out using the instrument of mathematics understanding ability. It was used to measure students' ability of mathematics understanding. Data were analyzed using statistics test of covariate analysis.

3. Results and discussion
The data of the understand mathematics ability in contextual learning with ethnomathematics at Rejang Lebong State High School, analyzed by ancova. As for the covariate variable was the cognitive style of students. The results was presented in the table 1.

| Source        | Type III Sum of Squares | df  | Mean Square | F     | Sig. |
|---------------|-------------------------|-----|-------------|-------|------|
| Corrected Model | 11133.753               | 4   | 2783.438    | 175.902 | 0.000 |
| Intercept     | 656.483                 | 1   | 656.483     | 41.487 | 0.000 |
| X             | 3827.764                | 1   | 3827.764    | 241.899 | 0.000 |
| A             | 324.550                 | 1   | 324.550     | 20.510 | 0.000 |
| A * B         | 591.171                 | 2   | 295.585     | 18.680 | 0.000 |

Based on table 1, Fo (X) = 241.899, df (1,53) and p-value = 0.000 <0.05, Ho was rejected. This is significant, there is a linear influence of students' cognitive style covariates on the ability to understand mathematics. See the corrected model line, Fo = 175.902 with db (4,53) and p-value = 0.000 <0.05 Ho is rejected. Thus, students' cognitive styles, learning models and mathematical approaches together influence the ability to understand mathematics. Further analysis is presented in table 2.

| Parameter | B      | Std. Error | T     | Sig. |
|-----------|--------|------------|-------|------|
| Intercept | -71.204| 7.404      | -9.617| 0.000|
| [A=1.00]  | 5.004  | 1.397      | 3.582 | 0.001|
| X         | 2.257  | 0.124      | 18.273| 0.000|
Based on table 2, \( t \) count = 3.582 and \( p \)-value = 0.001 <0.05. It was means Ho is rejected. These results show that the mean mathematical representation ability of students taught with contextual learning models is higher than students taught with conventional learning models after controlling students' cognitive style. Finally, we present the results of the ethnomathematics class data analysis.

| Parameter | B    | Std. Error | \( t \)  | Sig.  |
|-----------|------|------------|---------|-------|
| Intercept | -74.061 | 7.357      | -10.066 | 0.000 |
| [B=1.00]  | 4.970 | 1.418      | 3.505   | 0.001 |
| X         | 2.299 | 0.122      | 18.893  | 0.000 |

Table 3 shows that \( t \) count = 3.505 with \( p \)-value = 0.001 <0.05. Ho is rejected. The means that the average ability of mathematical understanding of students who are given ethnomathematics-oriented material is higher than students who are given non-ethnomathematics-oriented material after controlling cognitive style.

The results of this study clearly show that cognitive style, contextual learning and ethnomathematics influence the ability of mathematical understanding. This is in accordance with the study of Ardana, the mathematics learning that is cognitive style and constructivist insight that is valid, practical, and effective [17]. Mathematics learning that is produced can improve the quality of student learning.

Consistently, this paper supports the results of Widada and Herawaty, that mathematical understanding of students who are taught to use realistic mathematics learning is higher than those who are taught using conventional methods (learning material in both groups is not oriented to ethnomathematics) [16]. In addition to this, Herawaty and Widada states that the direct influence of cognitive covariate conflict on the mean concept of understanding ability of students taught by the Contextual Learning Model is better than the Conventional Learning Model [5]. Also, the direct influence of covariate cognitive conflict on Problem Solving Ability means that students who are taught by the Contextual Learning Model are better than Conventional Learning Models.

According to Widada and Herawaty, the mathematical understanding of students learning ethnomathematics oriented materials was higher than those studied in non-ethnomathematics-oriented material (realistic mathematics learning was applied to both groups) [16]. Third, mathematical understanding of students who study ethnomathematics oriented material is lower than students who study non-ethnomathematics material. Finally, we conclude that learning ethnomathematics can replace conventional learning approaches.

4. Conclusion

Based on the results of statistical analysis with covariate is the initial cognitive style, it can be concluded that: the students' understanding of math ability taught by a contextual learning is higher than that of students conventionally. Also, the linear influence of students' cognitive style as covariate toward the ability of understanding mathematics; Student cognitive style, learning model, and mathematics material orientation together influence to the ability of understanding mathematics. The ability of mathematical understanding of students who are learning oriented ethnomathematics higher than students who learn is not ethnomathematical oriented.

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