

Ethnomathematics Market's Days: An Instrument to Observe the Process of Student's Problem-Solving Mathematics

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ABSTRACT

To investigate the thinking process in solving mathematical problems, the teacher can provide various kinds of questions. Questions with High Order Thinking Skills content, questions with PISA content, and so on. In this study, the researcher used an ethnomathematical nuanced question in the form of a Javanese market day which was associated with number pattern material for the 8th grade of junior high school. This research includes research and development using the stages proposed by Plomp which consists of the Preliminary research, prototyping phase, and assessment phase. The quality of the test instrument developed is known from the validity test and trial. Validity test is carried out to determine whether the test instrument is which has been developed is in accordance with the ethnomathematics concept and Polya's problem-solving theory. Testing of the test instrument is carried out to see the level of reliability, discriminating power, and level of difficulty. Validity test is carried out by validating the test instrument developed to validators who are experts in the field of learning mathematics. Validation results the instrument shows valid results with a score of 87.87%. The test results show that the level of difficulty is medium, the discriminatory power is medium. This indicates that this instrument can be used to test mathematical problem solved.

Keywords: *Mathematical problem solving, Ethnomathematics, Instrument, Market's days.*

1. INTRODUCTION

The success of a learning process can be seen through assessment [1]. The assessment process is an important component to see the development of the quality of education. Evaluation is carried out in the context of controlling the quality of education nationally as a form of accountability of education providers to interested parties [1]. In addition, evaluation is carried out in order to obtain evidence data that can be used as an indication of the extent to which the ability and level success of students in achieving learning objectives after taking the learning process [2], [3].

In its implementation, evaluation is always closely related to the instrument. Instruments play an important role in knowing the effectiveness of the learning process [4]. The evaluation process includes two things, measurement and test. To be able to carry out evaluations, educators must take measurements in which

a measuring instrument called a test [3]. A test is defined as a specially designed data collection tool.

Mathematics is a universal science that underlies the development of modern technology has an important role in various disciplines and advances the human mind. The rapid development of information and communication technology is based on the development of mathematics in the fields of algebra, number theory, probability theory, analysis, and discrete mathematics. Therefore, mathematics needs to be taught to all students starting from the basic education level as an effort to equip the nation's generation to have the ability to think, analytically, logically, systematically, critically, and creatively. The National Council of Teachers of Mathematics (NCTM) standards state that there are five main standards in mathematics learning, namely problem solving, communication, connection, reasoning, and representation.

The ability to solve problems needs to be continuously honed and improved. Before students are faced with very complex real-life problems, it is highly recommended that students have the ability and problem-solving skills to get used to dealing with problems in the future. Mathematical problems given to students can not necessarily be said to be problems, it can be said as a problem if the problem cannot be answered immediately, but must go through a reasoning process. So that routine questions that are often given in class are not included in the category of math problems.

One of the mathematical problems that must go through a reasoning process in solving it is a culture-based problem. The integration of mathematics and culture in learning is referred to as ethnomathematics [5]. The concept of culture-based mathematical problems can continue to be developed and adapted to the culture that surrounds students. By integrating a culture in the learning process can make learning more meaningful. Indonesia has been known by the world as a country that has so much cultural diversity because it is a country with more than 17,000 islands in it which have different characteristics. The cultural diversity in Indonesia is a wealth that is not owned by every country. UNESCO believes that increasing cultural diversity in education can be an opportunity to develop the creativity of human resources [6].

Therefore, it is necessary to develop a culture-based evaluation tool. This study aims to develop a culture-based mathematical test instrument as a tool to measure students' problem-solving abilities. Disclosure of mathematics in a culture will certainly train students' reasoning skills so that a culture-based test instrument will be very relevant as a measuring tool for problem solving abilities.

This study aims to develop a problem-solving test instrument with the context of the Javanese market day. This research has never been carried out at SMPIT Hidayah Klaten.

2. METHOD

This research is included in the category of research and development (R&D) in the field of education. The development stage uses the stages proposed by Plomp which consists of preliminary research, prototyping phase and assessment phase [7]. The product in this research is problem solving instrument. After the product is developed, it is tested for its validity, practical and effectiveness.

On preliminary research, the researcher analyzed the problem of students by interviewing some mathematics teachers in some junior high schools. After that, the researcher determined one topic of the research. The development phase (prototyping phase) consists of the instrument solving mathematics problem with

ethnomathematical nuanced. The stages of Plomp's research are presented in Figure 1.

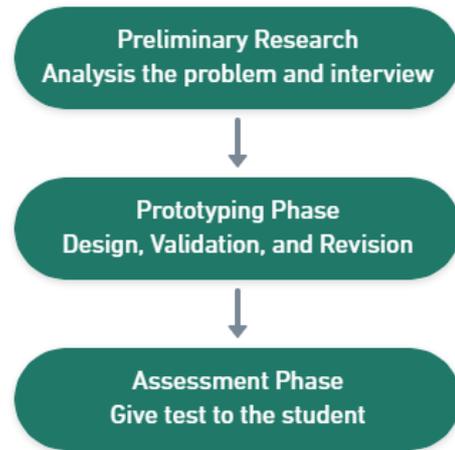


Figure 1. Steps of Plomp method.

The quality of the developed test instrument is known from the validity and trial tests. Validity test was conducted to determine whether the developed test instrument was in accordance with the ethnomathematics concept and Polya's problem-solving theory. The validity test is carried out by validating the test instrument developed to validators who are experts in the field of learning mathematics. The average of the results of the validator assessment is then compared with the assessment criteria for the validation results. The validation results are calculated by a formula.

$$R = \frac{\sum_{i=1}^m \sum_{j=1}^n V_{ij}}{mn} \tag{1}$$

In which:

R is the average assessment results from experts.

V_{ij} is the score of the j -th assessment against the i -th criterion.

m is the number of criteria

n is the number of expert who judge [8]

After being corrected and validated by 3 expert reviews (the validators), the next phase is assessment phase. In this phase, the researcher give the trial test to the nine grade students with sample of 32 students in SMPIT Hidayah Klaten to know about practical and effectiveness of the instrument.

3. MATH AND EQUATIONS

Scalar variables and physical constants should be italicized, and a bold (non-italics) font should be used for vectors and matrices. Do not italicize subscripts unless they are variables. Equations should be either display (with a number in parentheses) or inline. Use the built-in

Equation Editor or Math Type to insert complex equations.

Reliability test carried out in this study used Alpha Cronbach formula

$$CrAlpha = \left(\frac{k}{k-1}\right) \left(1 - \frac{\sum s^2p}{s^2t}\right) \quad (2)$$

In which

K is the number of questions in the test.

$\sum s^2p$ is the total item questions of varians.

s^2t is the variance of total score.

The difficulty level of the description form is used the following formula.

$$Mean = \frac{N-s}{n}$$

The classification of the level of difficulty of the questions in Table 1.

Table 1. Classification level of difficulty

No	Score	Level of difficulties
1	0,00 – 0.30	Questions are classified as difficult
2	0,31 – 0.70	Questions are classified as moderate
3	0,71 – 1.00	Question are relatively easy

4. RESULT AND DISCUSSION

The research was conducted with the plomp stage. Starting from the plenary research in which the researchers conducted observations and interviews with mathematics teachers. From the results of the interviews, it was found that students still had difficulties when faced with solving mathematical problems. This lack of problem-solving ability is caused by the teacher's inappropriate way of teaching. From here the researcher found the idea of connecting the habits of the Klaten people who like to shop at traditional markets as a case that was solved in a mathematical problem.

In the second stage, the prototyping phase, researchers begin to make instruments by first determining the material topics and cultural topics of the community that will be raised in problem solving. Researchers determine the culture of using Javanese market days. Next, the researcher developed an instrument consisting of a grid of questions, question sheets, and assessment guidelines. After that, validation was carried out by 3 experts.

The results of the validation, input and suggestions from the three experts were then corrected by the researchers. Improvements made include adding pictures to make the questions easier for students to understand and improving the scoring guideline. Furthermore, the research instrument is ready to be tested on students.

The third stage is the assessment test. At this stage, there were 32 ninth grade students involved. After the test, the researcher corrected the results of the student's work and then gave a score. From the score of the student's work, it can be determined the level of difficulty and reliability [9], [10].

The results of the instrument validation of ethnomathematical problem solving questions are 0.8787. It shows that the instrument is valid. The results of the trial test show the level of difficulties of the questions are classified as moderate with the score 0,57. It means the problems of the instrument can be use to measure students' mathematical problem solving.

5. CONCLUSION

The Javanese market day which is associated with the social habits of the people of Klaten district can be the content of the 8th grade math problem solving test of junior high school. Students can easily relate the problems around them with number pattern material, because students are close to the habits of people who use Javanese market days. Problem solving can be done by solving the problem according to Polya which consists of understanding the problem, planning a solution, executing a solution plan, and checking again. The instrument can be used for measure mathematics problem solving in junior high school.

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