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Using Local Stories-Based Questions to Improve Mathematics Problem Solving in Middle School Students

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Abstract:The purpose of this study is to describe the profile of problem solving ability of junior high school students with low mathematical ability in solving Javanese culture-based story problems. The subjects of the study were Grade VII students with low mathematical abilities with the criteria of being able to communicate well, verbally and in writing. The main instruments were researchers and supporting institutions consisting of mathematics ability test instruments, Javanese culture-based story questions instruments, and interview guidelines. Credibility in this study uses source triangulation. Data analysis was performed by data categorization, data reduction, data presentation, data interpretation and drawing conclusions. The results showed that: (1) the subject responded to the problem well, so that all data known based on the experience experienced, (2) the subject had not yet identified the facts of the problem and had not made a complete plan of completion, (3) the subject in completing incomplete and inconsistent processing and making mistakes in arithmetic operations, and (4) the subject has not yet reached a conclusion based on the right reasons.

Keywords:*local culture-based stories, problem solving capabilities, mathematics.*

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I. Introduction

Thinking is a mental activity that occurs in a person's mind, and can be seen from visible behavior. One of the behaviors that appears is the response of students when responding to the problem story. In responding to mathematical problems in the form of stories, there are some middle school students who have already done the problem solving stages (Perry et al., 2007; Zazkis & Liljedahl, 2009). The condition of a problem for a learner is that the questions confronted must be accepted by the learner and the question cannot be solved by routine procedures that the learner already knows. A question can be a problem for a student if he does not know the procedure to solve it or has got the problem solved (Dewiyani, 2008). It appears here that, a question becomes a problem depending on the individual and time. The meaningless questions confronted by students are not a problem for the student. In other words, the questions faced by students must be accepted by the student according to their cognitive structure.

The general objective of giving mathematics in primary and secondary education according to the

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Ministry of Education and Culture in 2013 is to (1) increase intellectual abilities, especially high-level students 'abilities, (2) shape students' ability to solve problems systematically, (3) obtain high learning outcomes, (4) train students in communicating ideas, especially in writing scientific papers, and (5) developing student characters.

According to Sabandar (2010), problem-solving ability is an ability that must be achieved and improved thinking is a priority goal of learning mathematics. Thus, if students are accustomed to solving problems, it can have a positive impact related to solving mathematical problems that have a relationship with their world. In the world of education, usually problems are questions or questions that must be answered or responded to. Problems arise when there is a gap between the current situation and the situation to come or between the current situation and the desired goal.

Recently there have been a number of studies concerning the problem solving abilities of students at the secondary level (junior high school). The results of Wulandri's research (2018), which conducted research on mathematical abilities showed that the ability to solve problems similar to PISA questions, the research findings revealed that the fifteen-year-old students' mathematical skills in solving PISA problems were in the low category but it was better than Indonesian students at PISA. Fletcher (2014) in his research proposed several methods to improve mathematical problem solving skills. Fletcher proposes the method of giving routinely in class exercises - questions for students. Anilan's (2018) research results for prospective teachers show as the results of this study, it appears that the problem solving ability of first grade students in the teaching department of basic education science has increased thanks to the conversion factor method, which they have experienced in solving chemistry questions for the first time. The purpose of this study is to describe the profile of problem solving skills of junior high school students with low mathematical ability in solving story-based story problems based on local culture. The subjects of the study were Grade VII students with low mathematical abilities with the criteria of being able to communicate well, verbally and in writing.

In connection with math problems, especially in junior high schools can not be separated from the environment where students learn. This condition greatly influences students' interest, motivation, and willingness to solve math problems, especially math problems in the form of stories. The mathematical problem of the form of the story that has to do with the environment of the place of learning, especially in the city of Semarang is certainly related to the existing culture, which is a story based on local culture. This is in accordance with the results of Jones (1999), namely the use of the language of discovery or conventional language to describe part-whole. And the language of discovery is used in the sense that one or more students suggest their own ways of describing mathematics. This language is used both in oral and written form. An example of discovery language is the use of "one of three" to describe mathematics rather than using conventional language, which is one third.

The aspects of students' problem solving abilities in solving story problems vary. One of the differences depends on students' mathematical abilities. Students with high mathematical abilities can respond to story problems by responding using strategies and representations based on their abilities. However, what about low-ability middle school students. What kind of responses can low mathematical-capable students give in responding to local culture-based story problems. It is henceforth necessary to conduct a study to explore the problem solving abilities of low mathematical junior high school students in solving story problems based on local culture. Some studies have highlighted the importance of local value inclusion based on storytelling on the mathematical ability of students (Perry et al.,

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2007; Zazkis & Liljedahl, 2009; Albano & Pierri, 2014; Gould & Schmidt, 2010; Casey et al., 2004; Schiro & Lawson, 2004; Istenic Starčič et al., 2016). Hence, this study aims to describe the profile of problem solving ability of junior high school students with low mathematical ability in solving Javanese culture-based story problems.

II. METHOD

The purpose of this study is to describe the profile of problem solving ability of junior high school students with low mathematical ability in solving Javanese culture-based story problems. The subjects of the study were Grade VII students with low mathematical abilities with the criteria of being able to communicate well, verbally and in writing. The main instruments were researchers and supporting institutions consisting of mathematics ability test instruments, Javanese Culture-based story questions instruments, and interview guidelines. A total of 32 students were selected. To collect data related to research questions, researchers need data regarding the activities of junior high school students when completing story questions. The data collection process in this study began with the provision of a story sheet based on local culture based story instruments to the research subjects to be completed. Subjects worked on local culture-based story problems according to their abilities and answered what they are as well as writing and verbally expressing what was thought when solving the problem of local culture-based stories. The researcher records the verbal expressions of the students and records the behavior (expressions) of the students, including the unique things that the subjects did when solving questions about the stories based on local culture. Next the researcher interviewed the subjects related to responses and representations relating to problem solving abilities.

Credibility in this research is by triangulation. Triangulation of interview data in this study uses triangulation of sources with different times of comparing and examining data or information from the results of solving local culture-based story problems, interview results obtained through different times. So that researchers may re-interview on the same subject, then compare the results of the interview at different times. In addition to triangulation, researchers also performed other techniques, namely matching research data through discussions with colleagues to examine data or information, interpretations of the results of prepared reports.

The process of data analysis in this study consists of: (1) categorization which is defined as the process of selecting and grouping data that has a common meaning if it is associated with the problem solving aspects of junior high school students in solving story-based story problems based on local culture, (2) data reduction in research this is interpreted as the process of removing unnecessary and irrelevant data, (3) the presentation / presentation of data in this study is defined as the process of writing data that has been categorized, then performed data checks to determine the consistency of information provided by the subject in order to obtain credible research data (data triangulation), (4) Interpretation / interpretation of data in this study is interpreted as a process of understanding the meaning of a series of data that has been presented. Furthermore, discussion and comparison of credible research results data are conducted with certain literatures and theories, and (5) drawing conclusions in this study is defined as the process of formulating the meaning of the results of research based on the results of the discussion of the data collected. This conclusion is intended to describe the problem solving ability profile of junior high school students with low mathematical ability in solving story-based math problems based on local culture.

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III. RESULTS

Based on the interview transcript of the research subjects, it can be described the problem solving process of junior high school students with low mathematical ability as follows:

1. The subject can identify the data contained in the problem, the subject's response to the problem read many times is good enough. This happens because the questions given are related to local culture-based stories, so that the subjects feel that these problems are often encountered in playing in the school or neighborhood. In addition, research subjects can also determine the main problem. Based on the results of interviews related to what aspects were asked, the subject has revealed it completely, even though the expression is through additional questions from the researcher.
2. Subjects in identifying the facts contained in the problem with scribble first, but have not been able to find a relationship between known data with what was asked. In addition, the subject has not revealed the steps that will be used in solving the problem, even though the subject has read the problem several times.
3. Steps taken by research subjects in solving story problems based on local culture based stories, initially by drawing and doodling. The subject made a mistake, because working in a hurry, as well as in the final calculation procedure without regard to the results that have been obtained.
4. From the results of the interview to re-examine the results of his work, the subject performs by re-reading the steps that have been done one by one. In the step of re-checking, there are two important aspects, namely: the process of completion and determining the final results. The subject states that he has checked the results of his work by reading at each step, but the research subjects have not provided reasons in accordance with the knowledge they had before.

Discussion of the problem solving process of junior high school students in solving story problems based on local culture stories using indicators of problem solving abilities and synchronized with the steps to solve mathematical problems in the form of stories.

Table 1. Level of Mathematical problem solving abilities of the respondent

Level of Mathematical Ability	Number of Students
High	9
Middle	15
Low	8
Total	32

The problem solving process of research subjects, the response is quite good related to the questions that are read many times. In "identifying the data contained in the story matter, the subject has revealed all the known data. This situation occurs because the story is associated with the habits of the subject in playing in the school environment and the place where he lives has a positive impact on the assimilation of his thought processes. This is consistent with the results of the study of Peter (2012) states that an environment that actively engages students in the investigation of information and the application of knowledge will promote the problem solving abilities of students learning. But in mentioning the data asked the subject was able to reveal, after getting stimulus questions from researchers. Bajracharya and Thompson (2014) states that the ability to solve problems is a development program whose methodology is comprehensive and complete. It is structured, productive and non-destructive method for creating new ideas. In addition, problem solving is useful and appropriate for generating different ideas. With repetition able to improve information recall due to the activity of

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strengthening the relationship between information. Information is stored in the mind in the form of information networks, so the more often one information path is used, the information on that path is increasingly strengthened in memory and can easily access information on that path.

Related to the data or information revealed by the subject, it means that the students' problem solving process in understanding story problems has been revealed in full. This is because the students' problem solving process is determined by the number of relationships between the observed objects and the schemes they have. Likewise the process of solving students' problems is a mental experience that connects one object to another. The object in question is the data / information that is in the matter of the story, while other objects are the knowledge possessed by the previous subject or experience gained in life at school or in the community.

The problem solving plan that is carried out by the research subject is to scribble first in order to know the relationship between what is known and what is asked. In this step the subject has not revealed the facts in the problem, so the research subjects have difficulty in making a complete settlement plan. The subject's experience in daily life has not been able to help the subject's knowledge to build complete knowledge that can link the facts in the problem. This is in accordance with the opinion of Hergenhahn and Olson (2009), which says that more experience allows one to adapt more easily to more and more diverse situations. If the situation is associated with indicators of critical thinking, then the subject has not been able to identify the facts given from a problem. Likewise in planning the completion steps, the subject has not revealed in full and detailed. This shows that the existing knowledge in the subject of research is very limited and has difficulty linking some of the information in the problem, so that it has not been able to find the right relationship between the known and the asked.

In the next stage which is to solve the problem not in accordance with the plan made. Subjects start by doing coat-strikethrough, but in the next step tends to be trial and error so that it seems not smooth and not systematic. This is because the subject does not yet have the knowledge of the concepts or knowledge needed to solve the mathematical problem. In this step, the research subjects did not work in the order that they had to go through, whereas in order to solve mathematical problems in terms of storytelling stories based on local culture, they had to use sequential steps in accordance with the procedures that had been learned. The student's thought process in remembering certain rules and procedures still seems weak, as well as in the case of arithmetic operations, the subject also experiences errors. This is possible because research subjects include students in low mathematical abilities, so abilities in cognitive aspects are less supportive. Colley et al. (2012), Marzano, (2001) stated that cognitive aspects have a responsibility for effective information processing and are very important for solving certain problems. The process includes the basis for decision making, understanding, analysis, and utilization of the knowledge possessed (Tok et al., 2015).

Based on these descriptions, it appears that subjects have not linked the internal network of knowledge that will be used in solving mathematical problems. Thus the stages of students' critical thinking processes in carrying out problem solving are as follows: (1) at the stage of carrying out the steps of solving not detailed and systematic, (2) in applying definitions or formulas there are some that are not in accordance with the plans made, (3) at the stage of deciding and implementing, the sequence of processes is not systematic, and (4) the final results obtained are not correct.

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Steps to re-examine the process and results of solving mathematical problems, research subjects have not done completely and thoroughly. Re-checking is done only by rereading without analyzing the steps that have been made. Even though the subject states that it has been done at every step, but only reads it without relating it to the knowledge that is already owned. Research subjects are convinced that the completion steps are correct, including the final answer. Likewise, research subjects have not yet reached conclusions based on valid reasons.

IV. CONCLUSION

The profile of critical thinking of junior high school students with low mathematical ability in solving math problems based on local culture-based story forms, based on interview data can be summarized as follows: (1) subjects respond to questions well, so they can determine all data known based on good experiences from the school environment and the environment where they live and at the stage of determining what is asked, the subject can mention the main problem, but requires a stimulus from the researcher, (2) at the stage of identifying the facts the research subject has not revealed all the facts that are in the problem and has not planned the steps. complete completion steps, (3) in the process of working out the questions incomplete and not detailed in order. The subject also made mistakes in arithmetic operations, and (4) the subject had not made an evaluation of the steps that were made carefully, because the subject only re-read the steps one by one and the research subjects were unable to draw conclusions based on the right reasons.

REFERENCES

[1]. Albano, G., & Pierri, A. (2014, May). Digital storytelling for improving mathematical literacy. In Proceedings of the Problem@ Web international conference: technology, creativity and affect in mathematical problem solving (pp. 23-34). Faro: Universidade do Algarve.

[2]. Anilan, B. (2018). Views and experiences of pre-service teachers on the use of stories in teaching science. Journal of Baltic Science Education, 17(4).

[3]. Bajracharya, R., & Thompson, J. (2014). Student understanding of the fundamental theorem of calculus at the mathematics-physics interface. Proceedings of the 17th special interest group of the Mathematical Association of America on research in undergraduate mathematics education. Denver (CO).

[4]. Casey, B., Kersh, J. E., & Young, J. M. (2004). Storytelling sagas: An effective medium for teaching early childhood mathematics. Early Childhood Research Quarterly, 19(1), 167-172.

[5]. Colley, B. M., Bilics, A. R., & Lerch, C. M. (2012). Reflection: A key component to thinking critically. The Canadian Journal for the Scholarship of Teaching and Learning, 3(1).

[6]. Dewiyani. (2008). Mengajarkan Pemecahan Masalah Dengan Menggunakan Langkah Polya. Stikom Jurnal 12(2), 87–95.

[7]. Fletcher, Nicole. 2014. Journal of Mathematics Education at Teachers College, v5 n1 p41-46 Spr-Sum

[8]. Gould, D., & Schmidt, D. A. (2010). Trigonometry comes alive through digital storytelling. Mathematics Teacher, 104(4), 296-301.

[9]. Istenic Starčič, A., Cotic, M., Solomonides, I., & Volk, M. (2016). Engaging preservice primary and preprimary school teachers in digital storytelling for the teaching and learning of mathematics. British Journal of Educational Technology, 47(1), 29-50.

[10]. Jones, G. A, Langrall, C. W, Thornton, C. A, Mogill, A. T. 1999. Students' critis thinking in instruction. Journal forResearch in Mathematics Education, Vol. 30, No. 5, page 487-.519 Washington: National Council of Teachers of Mathematics.

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ISSN: 0193-4120 Page No. 8513 - 8519

[11]. Marzano, R. J. (2001). A New Era of School Reform: Going Where the Research Takes Us.
[12]. Olson, M. H., & Hergenhahn, B. R. (2009). Theories of learning. Jakarta: Kencana.
[13]. Perry, B., Dockett, S., & Harley, E. (2007). Learning Stories and Children's Powerful Mathematics. Early Childhood Research & Practice, 9(2), n2.
[14]. Peter, E. E. (2012). Critical thinking: Essence for teaching mathematics and mathematics problem solving skills. African Journal of Mathematics and Computer Science Research, 5(3), 39-43.
[15]. Sabandar, J. (2008). Thinking Classroom dalam Pembelajaran Matematika di Sekolah. Simposium Internasional. Bandung: Universitas Pendidikan Indonesia.
[16]. Schiro, M., & Lawson, D. (2004). Oral storytelling and teaching mathematics: Pedagogical and multicultural perspectives. Sage.
[17]. Şükran Tok, Asiye Bahtiyar and Süleyman Karalök. 2015. The Effects of Teaching Mathematics Creatively on Academic Achievement, Attitudes towards Mathematics, and Mathematics Anxiety. Journal of Innovation in Science and Mathematics Education, 23(4), 51-63, 2015
[18]. Wulandari, N. F. (2018). Mathematics Skill of Fifteen Years Old Students in Yogyakarta in Solving Problems Like PISA. Journal on Mathematics Education, 9(1), 129-144.
[19]. Zazkis, R., & Liljedahl, P. (2009). Teaching mathematics as storytelling. Brill Sense.