

Students' Errors in Resolving Set Item Test based on Watson's Criteria

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Abstract: The study aims to identify these types of students' error in resolving set test item based on Watson's criteria (inappropriate data, inappropriate procedure, omitted data, omitted conclusion, response level conflict, undirected manipulation, skills hierarchy problem, in addition to above other) and the factors caused the students' error in doing set test. The research used quantitative descriptive approach by taking a sample from Grade VII Madrasah Tsanawiyah student of Gowa district. The test instrument used is a material description test. The results showed that the percentage of student error in resolving set test item based on Watson's criteria that is not accurate (5.56%), inappropriate procedures (16.29%), missing data (2.59%), missing conclusions (2.22 %), conflict response level (16.29), indirect manipulation (8.88%), skill hierarchy problem (2.96%), and others above (64.81%). Based on the percentages related to some mistakes that were often made such as ignorance in using the correct formulas to the questions, inappropriate completion steps, careless in mentioning the members of the set, and even there were some students who did not answer the questions at all. Therefore, concrete actions that can help the students to minimize errors in solving problems are by using learning methods or approaches that involve the students actively during the learning process or when answering questions such as using problem solving approaches.

1 INTRODUCTION

Science is an essential thing because by having it, someone can correct all problems, whether they are related to the world or the hereafter. Science is likened to light because it is a guide and light for people who are in darkness (Al-Abbasyi, Athiyah, M., 2002). Therefore, science has a crucial role in a person's life, because with human knowledge it is easy to get the glory of the world and the hereafter. The science of this world varies, ranging from mathematics, physics, biology, economics, astronomy, social science, sports, art, fikih (fiqh), aqidah (faith), and others. In this case, what will be discussed is mathematics.

Mathematics is the very significant part of human life because in everyday activities people cannot be separated from mathematical things Huljannah, M., 2015. Mathematics is not a solitary knowledge that can be perfect because by itself, but its existence is primarily to help humans understand and master social, economic and natural problems (Kiswanto, Rahman, & Sulasteri, 2015). Mathematics is a compulsory subject that starts to be SD/MI,

SMP/MTs, SMA/MA/SMK, even up to college (Lipianto, Danang & Budiarto, M. T., 2013) which can train students to be able to do calculations, understand mathematical concepts thus learning becomes meaningful (Mutia, 2017) develops and improves logical, critical, and creative ways of thinking (Nursalam, Angriani, A. D., Darmawati, Baharuddin, 2018) and builds quality human resources to develop an advanced national civilization in science and technology (Suharti, Latuconsina, N. K., Tasril, Sriyanti, A., & Halimah, 2018).

The role of the teacher in teaching mathematics is very important especially in the learning process. To get the good learning evaluation results, each teacher should be able to recognize various characters, models, strategies, approaches, methods and learning media which appropriate with the students. Furthermore, one of students' success in learning mathematics is the ability of students to accomplish mathematical problems through the evaluation of learning. In evaluating, there must be clear objectives. The goal of assessment in education is about everything that related to educational activities or processes that used as the center of attention or

observation (Suharti, Latuconsina, N. K., Tasril, Sriyanti, A., & Halimah, A., 2018).

Set is one of the mathematical materials taught in class VII in junior high school (SMP). This material is still considered difficult by several students because it requires high solution and understanding to get the answer. As a teacher who teaches in school every day, of course, it is not uncommon to handle students who experience learning difficulties (Wildana, Mustamin, S. H., & N. F., 2016). The results of interviews by researchers with math teachers at class VII MTs Syekh Yusuf Sungguminasa, Gowa Regency which revealed students' difficulties in learning. Some students could not interpret the questions using mathematical notation; they did not understand the use of symbols in the set material, grouping members in the set and understanding the item if in the form of a story. This statement is supported by the results of the daily tests of the set material at 2017/2018 academic year, only 30% of students received scores above the KKM. Regarding this result, the conclusion is the students' ability to solve the set items of the seventh-grade students at MTs Syekh Yusuf Sungguminasa in Gowa Regency was still low, and an action was needed to overcome these problems. Therefore, further research is needed to explore the mistakes made by the students using Watson's criteria including looking for the causes.

Some research related to the analysis of students' errors in solving the items based on Watson's criteria has been carried out by (Huljannah, 2015);(Nilasari, Tristian F., Hobri, & Lestari, Nurcholif, 2014);(Winarsih, Kurniya A., Sugiarti, T., 2015); (Lipianto, Danang & Budiarto, 2013); (Wildana, Mustamin, S. H., 2016);(Zakaria, 2010). From several of these studies, explained the analysis of students' errors in solving math items based on Watson's criteria. As we all know that the purpose of the analysis is to find out the real situation and can develop new insights in teaching. Meanwhile, Watson in, expressed that the criteria for errors in accomplishing the questions contained eight classifications, such as:

- a. Inappropriate data; the data was not appropriate or in other words was incorrect in entering values into variables.
- b. Inappropriate procedure; in this category, students tried to solve the problem with the correct system, but it used incorrectly. As wrong in using formulas, number operations, and operation marks.
- c. Omitted data; resolving the problem incorrectly because the data was lost or more.

- d. Omitted conclusion; in this category students shown appropriate procedures but failed to conclude.
- e. Response level conflict; in this category student worked on a problem not using concepts or directly reaching without a logical way.
- f. Undirected manipulation in this category students got the final answer without the providing the right reasons.
- g. The hierarchy problem of skills; in this category students could not solve problems because they were less skilled in using formulas and less accurate in calculations.
- h. In addition to the seven types above, in this category students did not call questions or items

Therefore, the analysis of students' errors in accomplishing the questions set using the Watson criteria can be used as an alternative that is useful enough to improve mathematics learning at MTs Syekh Yusuf Sungguminasa in Gowa Regency. The objectives of this study were to find out the kinds of mistakes made by students in solving set test based on Watson's criteria and to find out the causes of the students' error in answering those questions in class VII MTs Syekh Yusuf Sungguminasa Gowa Regency.

2 METHODS

This research was a qualitative approach by using descriptive qualitative as a research design. This research was carried out at MTs Syekh Yusuf Sungguminasa in Gowa Regency as many as 27 students as research subjects and the researcher selected several students to be interviewed to find out the causative factors of students' errors. The methods used to collect research data were diagnostic tests such as an analysis of the set questions, interviews related to the students' error, and documentation including the records of the interview, photos of the researcher's activities, and others supporting data.

The inspection of the validity of the findings data in this study used triangulation techniques. Triangulation is a technique to test the credibility of the data by checking data to the same source using different techniques (Sugiyono, 2014: 338-345). This study used triangulation techniques to test the credibility of the data by checking the data with the same source with different methods. The data analysis technique used qualitative descriptive analysis with aims to describe and summarize the meaning of collected data by giving attention and recording as many aspects of the situation as possible to obtain a

general and overall picture of the actual situation. The results of the data received from the tests and interviews have not existed in the form of scores so that the data analysis techniques used were reduction and presentation data, and verification.

3 RESULTS AND DISCUSSION

Based on the results of the test, it found that students made mistakes in working on set items based on Watson's criteria as follows.

Inappropriate data (incorrect data), this error category occurs in each item of the question from 27 students, namely five students on question number 1, five students on number 5, two students on number 6, two students on number 7 and one student in question number 8. The error data category of inappropriate data occurs in the questions number 1 and 5. The students did the test by counting the number of students who were interested in math and English then reduced the number of the students who were not interested of both. In the Venn diagram, the students were not accurate in entering the members of the set, it showed how the students only directly put the data contained from the question. In this category, students tried to operate a problem correctly, but the students chose inappropriate information or data. It meant that the students used the wrong data, forgot the correct formula, and entered the incorrect data into a set.

Inappropriate procedure (procedure is not right), this error category occurs in each item of question from 27 students, namely sixteen students at number 1, six students at number 2, four students on number 3, seven students on number 5, four students on question number 6, four students on question number 7, two students in question number 8, and one student on question number 9. The students wrote the members of set K and members of set L. Then, the students matched the members of set L with the members of set K that both had, then the students concluded that the members of the set of $K \cap L$ were 2 and 8. In this category, the students tried to solve the problem with the correct procedure, but they used the incorrect formula because of lack in understanding set.

Omitted data (data missing), this error category occurs in each item of the question from 27 students, namely one student on number 1, four students on number 5, and two students on number 7. Missing data errors occur in questions number 5. The students solved the problem incorrectly because of one or more missing data. The students were right in mentioning the members of set L and not accurate in

mentioning the members of set K. On the diagram Venn, the students then tried to complete by entering the members of the set K and L. There were also members of the new set which did not include as the members of set K and L, and several missing members of the set. In this category, students solve problems incorrectly because there were one or more missing data. It happened because the students were careless put the data. Thus, data or members of the set that should be the settlement were not included in the set.

Omitted conclusion (the missing conclusion), this error category occurs in each item of the question from 27 students, namely three students in number 3, one student on number 5, one student on question number 7, and one student on question number 9. The students solved the problem by showing the right procedure and mentioning the members of sets A, B, and C but failed to conclude it or the students solved the problem but forgetting to write the conclusion, so that the students' answer were considered incomplete. In this category, the students answered the questions by showing the right procedure, but they did not give conclusions.

Response level conflict (conflict level response), this error category occurs in each item of the question from 27 students, twelve students on question number 1, five students on question number 2, nine students on question number 3, seven students on question number 5, three students in question number 6, six students on question number 7, one student on question number 8, and one student on question number 9. The students showed an operation at a high level then decreased to a lower operation to give a conclusion. The students directly wrote S, M, and B members. On the Venn diagram, they seemed entering the data from the question. In this category, the students have shown an operation at a high level and then decrease to a lower activity to conclude. In other words, conflict response level was where the students answered a question, but they did not use concepts, or the students directly end their conclusion without using a logical way.

Undirected manipulation, this error category occurs in each item of the question from 27 students, namely eleven students on number 1, one student on number 2, six students on number 3, one student on number 4, three students in question number 6, one student in question number 8, and one student on problem number 10. The students counted the number of the students who were interested in math and English and who were not interested of both. Then, the students reduced them with the number of the students of VII grade in MTS Sheikh Yusuf

Sungguminasa Gowa Regency. In this category, students got the final answer without providing the right reasons, or the students' responses were correct but using straightforward and illogical or random ideas.

Skills hierarchy problem (the problem of the hierarchy of skills), this error category occurs in each item of the question from 27 students, namely three students in question number 2, one student in question number 5, and four students on question number 10. The students could not solve the problem after the students wrote the formula. The next step, the students wrote $P + Q = 38$. In this category, students could not complete the question because they were less skill in using formulas and less accurate in calculations.

Above other (in addition to the seven categories above), this error category occurs in each item of the question from 27 students. Five students on question number 1, eighteen students on question number 2, fourteen students on question number 3, twenty-six students on question number 4, twelve students in question number 5, twenty students on question number 6, ten students on question number 7, twenty four students on question number 8, twenty four students on question number 9, and twenty two students on question number 10. In this category, it contained students' errors that did not included in the seven categories above. The mistakes that fell into this category was the students did not respond; thereby the students chose not to answer.

Based on the students' errors in accomplishing the questions, the most students made a mistake other than the seven categories above (above other / ao) of 64.81%. The reason behind it because the students did not understand the set material; the answers of students who mostly choose not to answer some of the given questions. Teachers should provide more issues related to the content of the set, and then students can be trained and able to complete the concepts of the set.

Several factors influence the errors made by students, namely internal and external factors. The internal factors were 1) motivation, this factor explained that the students lack a lot of practicing their skills by working on set questions; 2) Interest, this factor explained that during the learning process, several students did not pay attention to the teacher's explanation, there was interference from other students, when they faced difficulties they prefer to ask their friends rather than the teacher, and several students did not like math; 3) Talents, this explained that the students had tried to pay attention but still did not understand and quickly forgot the teacher's

explanation. Based on this, it could be concluded that the condition of the students who did not care the material explained by the teacher so that the students did not understand the material. In addition, the students are less motivated to relearn material and practice answering questions about the set. The external factors included teachers and students. This factor explained the way the teacher taught material was not clear enough and the students preferred to play with friends around him.

4 CONCLUSIONS

Based on the results of the research and discussion that has been explained, it could be concluded that several types of errors were made by the students in the seventh grade of MTs Syekh Yusuf Sungguminasa Gowa Regency in answering set material questions, namely 1) inappropriate data/id; i.e. incorrect in using data and forgetting formula that must be used and wrong in entering data into a set. 2) inappropriate procedure/ip; i.e. to solve the problem with the correct procedure but the procedure used was not accurate because of lacks understanding of set material. 3) missing data (omitted data/od), i.e. careless in entering data, the data or set members that should be resolutions were not included in the set. 4) missing conclusions (omitted conclusion/oc) which was solving the problem by showing the right procedure, then failing to conclude or the students complete a problem but forgetting to write the conclusion. 5) response level conflict/rlc that was the students working on a problem not using the concept or directly concluding without a logical way. 6) undirected manipulation/um i.e. the students got the final answer without the right reasons, or the students' answers were correct by using very simple and illogical or random reasons. 7) skills hierarchy problem (shp), the students could not solve the problems because they were not skilled in using formulas and careless in calculating. 8) in addition to the seven categories (above other/ao), the students lack understanding of set material, they did not know what to write and where to start from. The factors caused the students to make mistakes in solving the set problem were internal factors and external factors. Internal factors include 1) motivation, lack of developing abilities. 2) interest which included less attention, disliking math, being disturbed, and lazy to ask. 3) talent; the students were difficult to understand even though they have been tried. The external factors included the teacher and the students, the way the teacher explained material that was not clear enough

and the student preferred to play with friends around him.

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