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Qualitative analysis on mathematical literacy ability and student responsibility with realistic mathematics education learning models of ethnomathematics nuance

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Abstract

The purpose of this research is to know the ability of mathematical literacy and the responsibility of students with an ethnomathematics-style Realistic Mathematics Education learning model. This type of research is a qualitative research that is descriptive. To establish the validity of qualitative data then the inspection techniques used in this research using the triangulation of the source, that is to compare the suitability of data obtained from the results of interviews and tests. The study was conducted on one of the junior high schools in Semarang, and there are 6 research subjects representing each of the 2 students for the group of high responsibility categories, 2 students for the category of medium responsibility groups, and 2 students for the group of low liability categories. In this study it was found that there were students representing the responsibilities of being granted results from mathematical literacy skills tests with the same results as students representing high responsibility groups. The factors influencing the findings are the thoroughness of the students representing the group of responsibilities being in Corrected their work.

1. Introduction

Mathematics is a very important and necessary science in life, as many human activities involve the calculations and logic that are part of mathematics. The ability of mathematical literacy can help a person to understand the role or usefulness of mathematics in daily life and as a basis of consideration and determination of the right decision. Therefore, one needs to have good mathematical literacy skills. A person is said to have good mathematical literacy skills when he is able to analysed, communicate his knowledge and mathematical skills effectively, and to be able to solve and interpret mathematical solutions. The purpose is for students to acquire, Manage, and utilize information to face problems in everyday life in order to survive a competitive state. Mathematics is an influential science in the development of science and technology. In an international student research program called Programme International of Student Assessment (PISA) organized by the Organisation for Economic Cooperation and Development (OECD) of conducting PISA studies include mathematical literacy, reading literacy and science literacy, aiming to assess the extent to which 15-year-old students are able to master knowledge and skills so that they can apply the knowledge gained The operation of PISA was conducted every three years, from 2000 to 2018. Indonesia participated since 2000 with Aim to compare the ability of Indonesian students to other country students.

Based on the results of the PISA study, Indonesian students ' scores were low. Indonesian students in the year 2015 only got a score of 386 of OECD 500 score, and in 2018 experienced a decline of 7 Point score, which only got a score of 379 and ranked 72 from 78 participating countries, (Harususilo, 2019). It

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was also strengthened based on the observation conducted by researchers at JHS 40 Semarang, researchers get a description of one of the class VIII mathematics teachers who say almost every class VIII student force that he had learned, 70% of class VIII JUNIOR students complained because often have difficulty in understanding the problems in each material from the math lessons taught both geometry materials, statistics, and algebra. Based on the explanation of one of the teachers, the difficulties experienced by students include: (a) errors in writing what is known, (b) errors in understanding what is asked, (c) errors in understanding the concept of the material being taught, (d) errors (erroneously) in using the Properties/principles contained in some material being taught, (e) errors in the use of the formula, (f) errors in performing operations such as addition and subtraction especially in integer material and SPLDV, (g) Difficulties in understanding learning materials, as well as difficulties in resolving the story related to daily life systematically. So that students often make mistakes in resolving the questions given. The lack of mathematics literacy skills of SMP students will have an impact on the next education level. Math literation in PISA focuses on students ' ability to analyse, give reasons, convey ideas of mathematical problems in a variety of content (1) Space and Shape, (2) Quantity, (3) Change and Relationship, (4) Uncertainly. Math learning contains not only materials, but there are values contained therein. One of the values of the character to be implanted is responsibility. According to the Kemendiknas (2010:10), responsibility is the attitude and attitudes of one person to carry out his duties and obligations, he should do, to oneself, society, the Environment (nature, social and culture), the State and God. The character of responsibility is important in the learning and learning Group.

The ability of mathematical literacy and student responsibility must be supported by an innovative and realistic learning. The innovation that can be done is by choosing the right learning model. One of the corresponding models and learning approaches is the Realistic Mathematics Education model of Ethnomathematics. By implementing the learning model students are trained to solve mathematical problems related to the real world. With the implementation of learning models It is also hoped that the student learning process can become more meaningful and enjoyable. RME has three principles, namely (1) A guided invention and process of Mathematization, (2) a decays phenomenon, (3) The formation of models by students themselves. In its implementation RME gives birth to realistic mathematical learning characteristics, namely: (1) The use of context, (2) The use of models, bridging by vertical instrument, (3) Student contribution, (4) Interactivity and, (5) intertwining (Treffer, 1991).

Ethnomathematics is the implication of cultural characteristics in mathematical learning (D'ambrosio, 2008). Ethnomathematics were first pioneered by Ubiratan D'ambrosio in 1985, Ethnomathematics may be referred to as "math in the Environment" or "mathematics in the community". Ethnomathematics are defined as special means used by a particular cultural group or community in a mathematical activity. Where the activity of mathematics is an activity that occurs in the process of abstracting from real experience in everyday life into mathematics (Rachmawati, 2012). Ethnomathematics that will be applied in this learning through traditional food typical of Central Java that will be purchased by students during exploration activities.

Based on the difficulties experienced by students in understanding the story related to daily life that researchers acquired at the time of observation. Therefore, the researcher provides an ethnomathematics-inspired RME learning model to the students, it is aimed to make it easier for students to understand the questions related to the daily life that will be given.

Based on the background of the problem described above, the issue of the problem that will be examined in this study is (1) is the implementation of Realistic Mathematic Education learning with ethnomathematics nuance by developing students ' responsible character to improve student's mathematical literacy skills? 2 Does the student's responsibility character affect the ability of mathematical literacy on a Realistic Mathematic Education learning model with Ethnomathematics? 3 How to description the ability of mathematical literacy based on student responsibility characters on the Realistic Mathematic Education learning model of ethnomathematics. (4) How does a description of students ' responsibilities on the Mathematic Education Realistic Mathematic Education model of Ethnomathematics.

The purpose of this research is to know (1) to test the effectiveness of class VIII students ' learning with the application of the Realistic Mathematic Education model of Ethnomathematics. (2) Analysing the adoption of a Realistic Mathematic Education learning Ethnomathematics of students ' responsibilities and the ability of Students ' mathematical Literacy (3) for a description of the ability to find mathematical

literacy based on the students ' responsibilities in a Realistic Mathematic Education model of Ethnomathematics. And (4) know the influence of students ' responsibilities on the ability of mathematical literacy on the Realistic Mathematic Education model of ethnomathematics nuance.

2. Research Methods

This research was conducted in JHS 40 Semarang and conducted in class VIII of school year 2019/2020. The research method used in this research is to use qualitative method that is a process of research and understanding based on Metodelogi that investigate a social phenomenon and human problem. Researchers made a complex picture, examined the words, detailed reports of the respondents ' views and conducted studies on natural situations (Creswell, 1998). According to (Sugiyono, 2007), there are three main stages in qualitative research, namely: (1) Stage description or orientation stage. At this stage, researchers describe what is seen, heard and perceived. New researchers have a glimpse into the information obtained, (2) the reduction phase. At this stage, researchers reduced any information obtained at the first stage to focus on a particular problem, (3) The selection stage, at this stage, the researcher outlines the established focus into more detail then performs an in-depth analysis of the problem focus. Sampling using a *cluster random sampliing* technique so that the experimental class is a class that uses an Ethnomathematics-inspired RME learning model that is class VIII A, while the control class is a class that uses expository learning models with lecture methods, FAQs, and discussions of class VIII B.

To select the subject of research to be interviewed, previously conducted grouping based on student responsibilities. Grouping responsibilities of students using the standard deviation according to Azwar (2015:149). The subject in this study was 6 people with 2 people representing the high responsibility category, 2 people representing the medium responsibility category, 2 people representing the low responsibility category Learning is done four times in the experimental class using an ethnomathematics-style RME model and a control class using an expository model. The material used is a two variable Linear equation system with completion using substitution method, elimination method and combined/mixed method. The variables used in this study were the ability of mathematical literacy and the responsibility of students. The data collection techniques used are (1) the documentation in use to obtain research supporting data, (2) a written test that is in posttest form, (3) poll of data collection conducted by giving a set of questions or written statements to the respondent to be answered, and (4) interviews conducted to obtain the students ' answers data on mathematical literacy skills and questionnaire for student responsibilities.

Analysis of qualitative data used is the data of interviews and poll results. The analysis of interviews in this research is done by reducing data, presenting data and drawing conclusions. The validity of the data is done by the triangulation technique that compares the mathematical literacy skills test results with the data of interviews.

3. Results and Discussion.

3.1. Qualitative Method analysis

Qualitative Data obtained from this research based on the results of posttest mathematical literacy skills and interview results conducted by researchers with research subjects. In this section will be shown an achievement for high, medium, low responsibility groups. The subject was selected based on consideration of the E-26 and E-25 subjects of the high responsibility group, the E-04 and E-31 subjects of the medium responsibility group, and the subjects E-09 and E-03 from the group of low responsibilities.

3.1.1. High responsibility mathematically literation skills

The research subjects interviewed for mathematical literacy skills with high responsibilities are the E-26 and E-25. Based on the test results mathematical literacy skills show that subjects E-26 and E-25 can achieve mathematical literacy very well. This is evident because both subjects are able to achieve the four

indicators of mathematical literacy in each given question. Although in question No. 5 There is one indicator that is not met by E-26 namely reasoning and argument indicators, but broadly, it is already inferred E-26 to control the fourth indicator of mathematical literacy. While the E-25 in Question No. 6 There are 2 indicators are not met, but broadly, the E-25 is also deduced able to control the four indicators.

The communication indicators for problems 1, 2, 3, 4, 5 and 6 of the E-26 subjects may understand and write information that is known and asked in relation to the purpose of the complete, precise and correct matter. Likewise, with the subject of E-25 in Question No. 1, 2, 3, 4, 5 and 6 of E-25 subject can understand and write the information known and asked related to the purpose of complete, precise and correct. This means that students are able to find important information contained in the problem and can re-write the information.

On the mathematical indicators in question No. 1, 2, 3, 4, 5, and 6 of E-26 subjects were able to translate the problem into mathematical language. As for the subject of E-25 in Question No. 1, 2, 3, 4, 5, and 6 subjects of E-25 were able to translate the problem into mathematical language. Only in question No. 6 is still a little less complete in his writing. Both students can change the information obtained in the form of mathematical models, precisely and correctly. This means that the student is able to change the statement obtained from what is known into the sentence or the mathematical language, In accordance with the theory of Burner being exposed by (Dalyono. 2007) on the iconic model and the Syimbol, where the students are able to represent their knowledge into a symbol or an image.

On the indicators of formulating strategies to solve problems in question No. 1.2, 3, 4, 5, and 6 subject E-26 able to plan an approach or strategy on completion Problem, and Sedangkang for the subject of E-25 in Question No. 1, 2, 3, 4, 5, and 6 subject E-25 able to plan an approach or solution solving the problem, although in question No. 5 did not finish done because the posstest time is over. Both students are able to use the strategy or steps that correspond with the command on the question to solve the problems in the problem. Although the question No. 5 can not be solved by the E-25 because of the completed work time. But overall students have been able to develop the right strategy to solve the problems given.

In the reasoning and argument indicators, the Question No. 1.2, 3, 4, 5, and 6 E-26 subjects were able to make the conclusion of the resulting solution despite the question No. 5 Subjects E-26 did not write the conclusion due to the posstest time was completed, and for the subject of E-25 in Question No. 1, 2, 3, 4, 5, and 6 subjects E-25 able to make conclusions from the resulting solution though to question No. 5 subject E-25 not write conclusions due to the posstest time is over , and in Question No. 6 also did not write the conclusion of the forgotten. Both students can also conclude the results obtained from the problems that have been resolved. This means that the student is able to argue and argument to make a conclusion in his completion.

3.1.2. Ability of mathematical literacy with moderate responsibility

The subject of interviews for mathematical literacy skills with moderate responsibilities are E-04 and E-31. Can master into four indicators of mathematical literacy. Although in question No 5, E-04 can not meet 2 indicators and E-31 can not meet 1 indicator in Question No. 6. But broadly, the students with a responsibility are already swept over the four indicators of mathematical literacy that has been set.

In the communication indicator in Question No. 1, 2, 3, 4, 5 and 6 of E-04 subjects may understand and write information that is known and asked in relation to the purpose of complete, precise and correct, and for the subject of E-31 also in Question No. 1, 2, 3, 4, 5 and 6 of E-31 subjects can understand and write the information that is known and asked in relation to the purpose of So both students can write down what is known and what is asked in full and precise. This means that students are able to find important information The question and can write back the information.

The mathematical indicators of the Question No. 1, 2, 3, 4, 5 and 6 of E-04 subjects were able to translate the problem into mathematical language and in Question No. 1.2, 3, 4, 5, and 6 E-31 subjects were able to translate the problem into mathematical language. Only in question No. 6 does not write the mathematical model because the problem is not completed because the work is done, but overall both students can change the information obtained in the form of mathematical models, precisely and correctly. This means that the student is able to change the statement obtained from what is known into the sentence or the mathematical language, In accordance with the theory of Burner being exposed by

(Dalyono. 2007) on the iconic model and the Symbol, where the students are able to represent their knowledge into a symbol or an image.

On the indicators of formulating strategies to solve problems in question No. 1.2, 3, 4, 5, and 6 subjects E-04 able to plan an approach or strategy on solving the problem, but for Question No. 5 is still less complete in the work because it is not completed because the working time is complete, and so is for the subject of E-31 in Question No. 1.2, 3, 4, 5, and 6 subject E-31 capable of planning a solution , although in question No. 6 did not finish done because the posttest time is over. But overall students have been able to develop the right strategy to solve the problems given.

In the reasoning and argument indicators, in question No. 1.2, 3, 4, 5, and 6 subject E-04 are able to make conclusions from the resulting solution though for Question No. 5 subjects E-04 did not write the conclusion because the posttest time is over, and so is the subject of E-31 in Question No. 1, 2, 3, 4, 5, and 6 subject E-31 able to make conclusions from the resulting solution though for Question No. 6 E-31 subject not write conclusions because the posttest time is over. This means that the students are able to argue and argue to make conclusions in the completion of the problem

3.1.3. Low-responsibility mathematical literacy skills

The subject of interviews for mathematical literacy skills with low responsibilities are E09 and E-03. Based on the results the analysis concluded that the students with low responsibilities were able to master the four indicators of pre-determined mathematical literacy.

In the communication indicators in question No. 1, 2, 3, 4, and 6 subject E-09 can understand and write the information that is known and asked in relation to the purpose of the complete, accurate and correct, while for the subject E-03 in Question No. 1, 2, 3, 4, and 6 subject E-03 can understand and write the information that is known Only in Question No. 3 The subject of E-03 is wrong in writing the information of what is asked in question, causing wrong strategizing or steps to solve the problem. So that students can conclude to find important information contained in the problem and can re-write the information. But there are also students who write what is asked not in accordance with the information ordered on the question that causes the students wrong in taking the strategy or steps to solve the problem.

The mathematical indicators of Question No. 1, 2, 3, 4, and 6 of the E-09 subjects were able to translate the problem into mathematical language. Only in question No. 6 does not write the mathematical model because the problem is not completed because the work is complete, while for the subject E-03 in Question No. 1, 2, 3, 4, and 6 subject E-03 able to translate the problem into the mathematical language. It is still incomplete in its writing. This means that the student is able to change the statement obtained from what is known into the sentence or the mathematical language In accordance with the theory of Burner being exposed by (Dalyono. 2007) on the iconic model and the Symbol, where the students are able to represent their knowledge into a symbol or an image. But with the presence of students who cannot write with the complete process of mathematics in accordance with the grid assessment in the indicator of mathematical literacy skills, so that the students are not really thorough in changing the information obtained into the form of mathematical models.

On the indicators of formulating strategies to solve problems in question No. 1, 2, 3, 4, and 6 E-09 Subjects able to plan an approach or strategy on solving the problem, but for Question No. 6 still less complete in the work because it has not been done because the working time is complete, while for the subject E-03 in Question No. 1, 2, 3, 4, and 6 subject E-03 capable of planning Solving the problem. Just for Question No. 3 wrong using strategy or step in the completion of the solution, this is due to the error of the subject E-03 in writing what information is asked to cause errors in the process of the solution of its completion, and in Question No. 4 is done because the posttest time is over. So, it can be concluded that there are students who are able to use the strategy or steps in accordance with the instructions on the question to solve the problem in the problem. Although the question No. 5 was done by E-09 because it felt that the problem was quite difficult to solve and in question No. 6 also cannot be solved by E-09 due to the finished work time. But overall students have been able to develop the right strategy to solve the problems given. In addition, there are also students who cannot use strategies or steps that correspond to the instructions on the question, for example in Question No 3 done by E-03, in which case the E-03 use the wrong strategy or step in the work does not correspond to the information ordered on the question, in

addition to Question No. 3 which is done not in accordance with the orders given The E-03 also did not work on Question No. 5 because it was difficult to work with.

In the reasoning and argument indicators in Question No. 1, 2, 3, 4, and 6 subjects of E-09 were able to make a conclusion of the resulting solution though for a question No. 6 The subject of E-09 did not write the conclusion because the posttest time was over, whereas for the subject E-03 on Question No. 1, This means that students are able to argue and argue to make conclusions in their completion. On this indicator the E-03 is not at all noticeable can conclude the outcome of what was already done. This is evident from the work of E-03 which does not make any conclusions on each of the questions done. This means that not all students are able to conclude the results obtained from what has been done.

3.1.4. Description of Student responsibilities

At the time of study of the RME Ethnomathematics, it appears that the subject of E-26 fulfills several indicators of responsibility, one of which is the discipline of collecting timely assignments as prescribed by the teacher. In addition to the disciplinary subject of E-26 also meets the indicator of commitment in learning, where there is free time used by the subject E-26 to work on the tasks that exist in the Book of mathematics package although not in command. By the time the teacher explained in front of the class E-26 also noticed and listened to what the teacher explained, so that when given an individual question the subject E-26 can answer correctly. At the stage of the group activity, the E-26 subject also wants to convey his opinion to a group friend and when a group of friends convey the opinion of the subject E-26 also listen and appreciate the opinions of his friend. When asked to display the results of the group discussion in front of the subject class E-26 also dare forward to explain the results of the group discussion.

When the learning process of RME is ethnomathematics, it is evident that the subject E-25 meets several indicators of one of its responsibilities, where the subject of E-25 is always dating and collecting tasks on time. When the teacher explains in front of the subject class the E-25 always pays attention, when the teacher gives an individual question an E-25 subject can answer it properly. At the group's discussion stage, the subject of E-25 would convey opinions to the members of his group and would appreciate and listen to the opinions conveyed by his friend. When asked to conclude the results of learning E-25 subjects can also make the conclusion of what is already learned though less precise.

When the RME learning process is ethnomathematics, it is seen that the subject E-04 fulfills some of the responsibilities of one of its disciplinary indicators, where the E-04 subject comes and gathers the task on time. Do not make rowdy in class at the time of learning, and pay attention to the moment the teacher explained. At the time of discussion of the subject group E-04 also want to hear and appreciate the opinions expressed by his group friends, besides the subject E-04 also want to convey his opinion when discussing. But when asked to conclude the results of learning the subject E-04 was always confused even though told to repeat what he had already mentioned.

During the learning process of RME ethnomathematics, it is evident that the subjects of E-31 were less disciplined in collecting assignments, several times the E-31 subjects did not accumulate the assignment on time according to the predetermined. When the teacher describes the E-31 subject and To hear the explanation given, though when given the question always answered in a slow and less precise voice. During the activity of the group, the E-31 would express his opinion to a group friend and listen and appreciate the opinions expressed by his friend. The E-31 subject also dared to convey the results of its group discussions in front of the class and when asked to conclude the E-31 subject learning outcomes can conclude what has been learned despite the slow and hesitant sound.

In the learning process of the RME ethnomathematics, it appears that the subject of E-09 is less disciplined in collecting assignments, since it often collects in timely tasks according to the predetermined, copying it during the course of learning the subject E-09 also often makes rowdy in class so that when the teacher gives an individual question the subject of E-09 At the time of discussion of the subject group E-09 expressed his opinion and listened and appreciated the opinions of his group mates.

In the learning process of the RME ethnomathematics, it is seen that the subject of E-03 is less disciplined because it often does not collect the task at a specified time. In addition, when learning E-03 subjects also often make a noise in the classroom so that when the teacher gives a question the subject E-03 cannot answer. At the time of discussion, the group of E-03 will listen and appreciate if there are

friends who give opinions and sometimes want to convey their opinions to the group members at the time of discussion. However, when asked to convey the results of his group of subjects E-03 not dare to convey. When asked to conclude the results of learning the subject E-03 cannot conclude because it does not pay attention when the teacher explained.

Based on the qualitative data obtained from the study, RME learning is very good to apply to improve mathematics literacy skills as well as students ' responsibilities. In this case, the RME learning model of Ethnomathematics is one of the learning models that can make students accountable, because in learning students do activities that make students accustomed to behave and behave represent the responsibility of learning. RME gives students the opportunity to experience a process similar to the mathematical creation of building their own mathematical tools and ideas, discovering for themselves the answer. As a result, teachers only act as facilitators, motivators, and class managers who can create a class atmosphere that supports open, communicative and joyful Learning Processes (Supardi: 2012). In this study, Guru provides contextual problems to students such as, assigning students (which have been formed group, where one group consists of 5 students) to go to the market observing the traditional food prices sold in the market, then students are asked to buy 2 different types of snacks. (This activity is conducted outside of math learning hours or outside school hours). Then Shiva performed an assignment that had been given by the teacher at the previous meeting. That is, some kind of traditional hawker that has been purchased by the students, then from the food that the student has purchased, the teacher asked the students to make a question using a mathematical model on the condition students do not tell his friend who was in another group the price of the unity of the food purchased by the group. This is because the questions made by each group will be exchanged for other groups to be discussed. Groups that have gained questions from other groups, discussing with their peers to solve the problems that have been given. Then the results of the discussion, can be submitted to the group who gave the question to correct the answer that is displayed whether the findings of the group given the question according to the actual price of the Hawker per unit that has been purchased by the group of the problem. From the discussion activities, the students corrected the work of the group that had been given questions about the group. Here the teacher's role is as a correction of the question and answer that has been given and done by the students whether it is in accordance with the mathematical modeling or not, if not then the teacher will direct the students to fix the less precise part of the problem that has been made by the students and the answers that have been employed by the students. So, between students with students and students with teachers will build positive interactions. From the activities that students have done, the teacher asks students to conclude the results that the students gained from the lessons students have attended. Thus, the students are expected to bring about simultaneous understanding of the materials they are teaching. So, of learning activities using an ethnomathematics-inspired RME model familiarize the students to behave and conduct responsibilities. So, through these learning models and the application of responsibility attitudes to the students has an impact on the level of mathematical literacy skills owned by students.

Based on the researchers ' development during lessons and scores of mathematical literacy skills, it is concluded that high-responsibility students also have scores on high test results. While there are also students in the category of medium responsibilities with the results of the same test as the students in the category of high responsibility, after conducting interviews with the students in question acquired the fact that while working on posttest students in question did not accidentally see the work of a friend next to him who is a student in the category of high responsibility, where his friend was working on the complete question so that when the student corrected his work he just realized that there is part of Stage in solving the problem that he forgot to write so that in the work on the next problem the students can work on the complete posttest in accordance with the steps that have been studied.

4. Conclusion

Based on the explanation above, it can be concluded that students ' mathematical literacy skills with Realistic Mathematics Education learning model with an ethnomathematics achieve a classical genius and minimal submission criteria. In addition, the students ' responsibilities have an effect on the ability of students ' mathematical literacy with a Realistic Mathematics Education learning style.

The achievement of the indicator of mathematical literacy capability in each group is (a) the subject with high responsibility can complete 5 out of 6 problems that fulfil the four mathematical indicators. One of them can only complete 4 out of 6 problems that meet the four indicators of mathematical literacy; (b) The subject with a moderate responsibility also has a difference in the achievement of the indicator although the problem they have completed is 5 out of 6 questions, but the number of questions that they can not complete each different number of questions. The five problems that they can work on are fulfilling the four predefined mathematical indicators; (c) Low liability subjects have a difference in the achievement of indicators. One of the subjects was able to complete 3 questions from 6 questions that filled the four indicators and there was one problem that could not be done. While one of the subjects can only meet 2 indicators for 5 out of 6 questions done and there is one problem that can not be solved by one of the subjects.

Achievement indicators of students ' responsibilities using an Ethnomathematics-inspired RME learning model in each group are as follows. A Subjects with high responsibilities meet four indicators of responsibility, namely discipline, sportsmanship, obedience to the order, and commitment to learning; (b) The subject with responsibility is fulfilling the three indicators of responsibility, i.e. discipline, sportsmanship, obedience to the code of conduct. (c) Low liability subjects meet two indicators of responsibility, which is discipline and commitment in learning.

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