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The decision making strategy of prospective mathematics teachers in improving LOTS to be HOTS problem

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Abstract

This study aimed to explore the decision making of a prospective mathematics teacher in the process of improving a Lower Order Thinking Skills (LOTS) problem to be a Higher Order Thinking Skills (HOTS) problem. This study involves 51 prospective mathematics teachers taking part in improving HOTS problems. Two students were chosen based on their uniqueness and quality of HOTS problems produced and their fluency in communication. Semi-structured based task interviews were conducted to both participants in exploring the decision-making process-based. Furthermore, the data were analyzed qualitatively. The results showed that S1 was able to produce three-question related to one another, take two questions assess the reasonableness, finally decide one problem consisting of two items. S2 was able to generate three separate ideas, clarify the three ideas, and assess the three ideas and finally decide on one HOTS problem. S1 and S2 are still lack in involving Pedagogical Content Knowledge in assessing ideas especially. These results have an impact on the importance of developing a teaching model that improves the Decision making Strategy Furthermore, it is necessary to explore the decision-making process of pre-service and in-service mathematics teachers in developing the HOTS problems.

Keywords: higher order thinking skills, generating, clarifying, assessing ideas.

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1. Introduction

The 2013 curriculum in Indonesia is designed with various improvements to start familiarizing students with higher-order thinking skills. First, in the assessment standards, the 2013 curriculum gradually adapts international standard assessment models. Assessment of learning outcomes is expected to help students to improve HOTS because higher-order thinking skills can encourage students to think broadly and deeply about the subject matter. Secondly, on content standards, namely reducing irrelevant material but deepening, expanding, and enriching relevant material for students to improve critical and analytical thinking skills under international rules [15].

The implementation of the 2013 curriculum is marked by starting to apply HOTS in learning and assessment in the classroom. It expects that mathematics learning can further encourage the development of students' thinking skills and creativity. HOTS problems have also begun to be used in National Examinations starting in 2017 and would increase to the 2018 national examinations. For example, in the National Examination (UN) for Vocational High School and Senior High School levels for the 2017/2018 academic year. The implementation HOTS problem in mathematics subjects received a lot of responses from examinees. It became viral on social media because of the difficulty of completion compared to other questions. Whereas, the policy of applying the HOTS model question is intended to train children to think critically, creatively, and analytically. Ministry of Education and Culture is sure to apply the High Order Thinking Level (HOTS) method for the National Examination (UN) at the Junior High School at 2018[3]

The concept of high-order thinking skills (HOTS) originates from Bloom's cognitive domain taxonomy [13]. The cognitive domain involves knowledge and intellectual skill development [7]. They include the recall or recognition of specific facts, procedural patterns, and concepts that serve to develop cognitive abilities and skills. There are six main categories of cognitive processes, ranging from the simplest to the most complex. Bloom categorized cognitive behavior into six levels of thought: knowledge, understanding, application, analysis, synthesis, and evaluation [11], [29]. In the 1950th, Bloom and his colleagues [7] established a hierarchy of educational goals, which well known as Bloom's Taxonomy. Although Bloom and his colleagues did not explicitly write about the order or complexity of thought, their educational purposes involved cognitive processes ranging from low-level thinking skill (knowledge) to high-order thinking skills (evaluation). After a few years, his student, Anderson and his colleagues, revised Bloom's Taxonomy in which they changed from the use of nouns to verbs and also showed that the highest level of thought was not evaluation but "creation" [5], [18].

In improving useful HOTS problem items, the problem developer is required to be able to determine the behavior to be measured and formulate material that will be the basis of questions in a particular context following the expected behavior [28]. However, the description of the document asked (which demands high reasoning) is not always available in the textbook. Contexts that are not under the conditions of students may cause difficulties for students not only in solving HOTS problems but also in understanding problems. Therefore, in developing HOTS problems, mastery of teaching materials is needed, and teacher creativity in selecting stimulus problems is appropriate to the situation and condition of the area around the education unit. Structured questions are the ones where the introduction and purpose situation are clearly defined, and there is only one correct answer. One can achieve the correct answer through one or more numerical operations. In such kind of problems, students reach the answers of questions with the help of the formulas they have memorized without needing to think in-depth and make interpretations [4]

Several studies related to HOTS are about the assessment of HOTS as a study of elementary school level exam questions in Uganda [18] that examined the proportion of LOTS and HOTS in national examinations. High-level thinking perceptions among engineering Richland education students

[14], [6] who examined the thinking process of high school students in solving HOTS problems, the relationship between high-level thinking and academic performance of students in learning mathematics [25]. Comparative analysis of analogy thinking and higher-order thinking in mathematical studies by [21]. A research about the level of knowledge and practice of Mathematics Teachers in implementing HOTS in high schools in Terengganu [1], [10] examined the development of the higher-order thinking skill (HOTS) assessment instrument in mathematics in the eighth class of junior high school.

Teachers have a significant role in the lead the student mastering HOTS Problem. The teacher needs to make learning material into something interesting to learn. The teacher or can develop problems that can stimulate students to think and practice in the problem-solving process. The teacher's question should be open and lead to investigation and should be divergent, not simple, open-ended, and stimulate students to learn by collaborating. The assessment of HOTS is critical in mathematics learning. Through HOTS assessment, mathematics learning can be encouraged more optimally in supporting students' growth and development. Teachers, as the spearhead of the implementation of learning, need to continue to improve understanding related to the concept and application of HOTS assignment or assessment so that they can implement it in class.

Based on an interview with some Junior High School Teachers in East Java province, Indonesia, the researcher knows that the HOTS problems in textbooks are minimal. The teacher said that there is about 15 % of the problem need higher-order thinking skills to solve them. Therefore, they need to find out the problems in different ways, for example by looking for on the internet, developing by itself, improving LOTS to be HOTS problem. Some teachers can find or establish HOTS problem that suitable for the students' characteristics and class, but unfortunately, some teachers face difficulties generate idea and produce HOTS problem. The teacher's efforts imply for the mastering of HOTS for students and have an impact on the passing level of the National Examination and achievement in mathematical competitions

The learning planning process that involves problem-solving done by the teachers involves the cognitive process of the teachers. Thinking is a form of cognitive process in an individual. The thought process can occur when someone makes a decision and solves a problem [20]. Complex cognitive processes underlie thinking and decision making of teachers in the planning and implementation of learning [9]. The quality of learning undertaken by teachers is dependently on the decision made.

Decision making represents an act of choosing something among several alternatives through a mental process, thinking logically, and also considering all the choices available. Decision making shows the process of selecting preferred options or actions among a set of alternatives based on the criteria or strategies provided [26], [27]. Decision making is an alternative action or strategy taken by someone using analytic and interactive intuitive [2]. Based on the opinions above, the teacher's or prospective teacher's decision making involves the cognitive process of the teachers. Decision making is a critical cognitive process used in every area of human life. In this process, the individuals play an active role and obtain outputs parallel with their practical use of decision-making skills. Therefore, the decision-making process and the abilities regarding the effective management of this process can affect the course of life, life satisfaction, and the social relations of an individual.[12]

In making decisions, someone involves a thought process that starts with generating ideas, clarifying ideas, and evaluating the reasonableness of ideas [24]. When a teacher makes a decision, the teacher tries to generate ideas. The generated ideas must be explained by considering their similarities and differences, combining those who have similarities and separating different ideas. However, not all ideas are under normal conditions. Then the idea must be evaluated to make the best decision used in decision making. [17] also states that every teacher's decision based on memories or schemes from previous experiences, pedagogical knowledge, content knowledge, and teacher beliefs

and preferences.

Research on mathematical assignment decisions has been carried out. [23] studied teacher decisions in planning mathematical tasks to be proposed and how teachers would arrange lessons. The first teachers decide to identify the potential of the assignment and to what extent it fits into their curriculum goals. The second decision is whether the assignment request is appropriate for students. The third decision relates to the potential of the task to serve the diversity of students' readiness.

Research on decision making was conducted by [16], who focused at the decision making of elementary school mathematics prospective teachers in giving problems and choosing math assignments in learning. The research shows the results of prospective teacher decision-making about the mathematical task selected and the influence of the series of questions given in learning. Mathematics assignments selected by prospective teachers are not informed in the form of problems or not. [16] does not reveal the decision making of prospective teachers as a cognitive process that includes how prospective teachers develop ideas, clarify and evaluate the reasonableness of ideas. [19] further investigated the decision of the winner of a student creativity competition in designing ICT-based mathematics learning media.

Some research on decision making shows that no research focuses on revealing the decision making of mathematics education students in designing LOTS questions to become HOTS focused on a specific material topic. Referring to the results of interviews with Mathematics teachers in East Java, Indonesia conclude that HOTS questions, especially in statistical material, are still limited on the textbook or other resources, while on the National Examination, the topic was tested in the form of HOTS problem. This phenomenon certainly requires resolution, one of which is to improve the level of thinking in the problem. The in-service teacher, preservice teacher, or prospective teacher have a great responsibility. The mathematics education student, as a prospective teacher, must have the ability to provide HOTS problem. Preliminary study studies presented that some symptoms arise in the decision-making process of improving the question.

Based on the information above, the purpose of this study is to explore decision making in improving LOTS into HOTS problems, which includes three stages, namely generating ideas, clarifying ideas, and assessing the reasonableness of the ideas. Besides, this study described a pattern of the decision making of the prospective math teachers. The study will contribute to the development of decision-making theory, especially in the context of improving HOTS statistical problems. Practically, the results of this study can be used as a reference for mathematics educators to provide HOTS questions for students and imply the growth of critical attitude, creative, and effective decision-making abilities of the HOTS problem. Also this will have an impact on the passing rate of students on the national examinations.

1.1. Problem Research Problem

Some research on decision making shows that no research focuses on revealing the decision making of mathematics education students in designing LOTS questions to become HOTS focused on a specific material topic. Referring to the results of interviews with Mathematics teachers in East Java, Indonesia conclude that HOTS questions, especially in statistical material, are still limited on the textbook or other resources, while on the National Examination, the topic was tested in the form of HOTS problem. This phenomenon certainly requires resolution, one of which is to improve the level of thinking in the problem. The in-service teacher, preservice teacher, or prospective teacher have a great responsibility. The mathematics education student, as a prospective teacher, must have the ability to provide HOTS problem. Preliminary study studies presented that some symptoms arise in the decision-making process of improving the question.

1.2. Research Focus

Based on the information above, the purpose of this study is to explore decision making in improving LOTS into HOTS problems, which includes three stages, namely generating ideas, clarifying ideas, and assessing the reasonableness of the ideas. Besides, this study described a pattern of the decision making of the prospective math teachers. The study will contribute to the development of decision-making theory, especially in the context of improving HOTS statistical problems. Practically, the results of this study can be used as a reference for mathematics educators to provide HOTS questions for students and imply the growth of critical attitude, creative, and effective decision-making abilities of the HOTS problem. This will also have an impact on the passing rate of students on the national examinations

2. Methods

2.1. General Background of Research

This research was an explorative type of qualitative research. In this study, the researcher explored the teacher's decision-making process in modifying LOTS problems into HOTS problems, which included generating ideas, clarifying ideas, and assessing the reasonableness of ideas. Besides that, this study will present the prospective math teacher decision making patterns, along with the reasons for each stage of decision making.

2.2. Sample of Research

Participants in this study were fifty-one prospective mathematics teachers who came from the fifth-semester education students in IAIN Jember, who had taken a mathematics learning evaluation course. Based on the HOTS problem created, two subjects who could explain well to the decision-making process were selected.

The steps to get the subjects were: 1) Giving LOTS problems about the combined average material for junior high school level at the application stage (C3) 2) Asking students to improve into HOTS problems. The next steps were 3) Selecting student work that successfully modified LOTS problems into HOTS 4) conducting in-depth interviews with the participant's decision-making process.

2.3. Instruments and Procedures

The data taken were data about the prospective teacher decision-making process, which included generating ideas, clarifying ideas, and assessing the reasonableness of ideas from modification of LOTS problems to HOTS problems. For this purpose, the data consisted of 1) data on the results of student work in the form of HOTS problems and 2) data on the decision-making process. As for the operation of taking data on student work, the researcher prepared an instrument in the form of 1 LOTS type problem on the topic of statistics on combined average material. The problem made referred to as the essential competencies that existed in the junior high school mathematics curriculum. The following is a statistics material item from a textbook question.

Given that the average mark of female students is 80, the average mark of male students is 75, while the number of female students is 12, and the number of male students is 18. What is the average mark of the class?

Figure 1: LOTS problem of C3 level.

The problem had passed through the readability test and expert validity test conducted by three validators consisting of two mathematics education lecturers and one Junior High School mathematics teacher. To find out the decision-making process, then the researcher, as the main instrument, conducted semi-structured interviews assisted by interview guidelines that referred to the steps of the Swartz decision-making process, as shown in Table 1.

Table 1: Decision Making Process of Improving LOTS to be HOTS Problem (Addapted Swartz et al. 1998).

Generating ideas	• ***Mentioning the possibilities of HOTS problem that arise from LOTS in various bloom taxonomic levels.*** • ***variation of ideas in improving the cognitive level from C3 to (C4, C5 or C6).*** • ***Detailed idea of the HOT problem.***
Clarifying ideas	• ***Analyzing ideas*** • ***Comparing ideas about HOTS problem one with another*** • ***Grouping ideas about similar HOTS problems*** • ***Selecting the appropriate HOTS problems*** • ***Analyzing Arguments*** • ***Finding the reason behind the idea about HOTS problems that are chosen***
Assessing the reasonableness of ideas	• ***Assess the essential information in HOTS problems selected about basic competency gained*** • ***Making predictions about the solution of HOTS chosen problems, the possible difficulties***

The researcher asked the students to explain their completion steps by looking at the results of HOTS problems worksheet improved previously. In this process, the researcher recorded audio and visual activities of the students. In this case, the researcher was a planner, executor, data collector, analyzer, data interpreter, and continued reporting research results.

2.4. Data Analysis Data Analysis

According to the data obtained, then the research analyzed according to the stages of data analysis. Namely, 1) sorting the data improving LOTS problems into HOTS problems 2) reading all data of the decision making process, 3) coding the participants' answers, 4) describing the decision making process data of prospective teachers, 5) presenting data on the decision making process, 6) interpreting / making sense of the data on the decision making process.

3. Results of Research

The research involved fifty-one, there were twenty-six participants fail to improve LOTS into HOTS problems. Twenty-five participants succeeded in making HOTS problems at the analysis level. Table 2 represents the participants.

Next, from the twenty-five participants, two participants, namely S1 and S2, were selected based on HOTS problems produced and the uniqueness of the product, and the decision-making process was explored.

Table 2: The Description of Participants.

Gender	*Male*		*Female*	
f	*21*	-	*30*	-
%	*41*	-	*59*	-
The cognitive level	*C3*	*C4*	*C5*	*C6*
f	*26*	*25*	*0*	*0*
%	*51*	*49*	*0*	*0*

Table 3: The HOTS of S1 and S2.

Participants	*Hot Problem Developed*
S1	*The average mark of a class is 77. If the average mark of ones is 80, the average mark of girls and boys students are 12 and 18, then* • *What is the average mark of female students and male students?* • *What is the ratio of the average mark for males and females?*
S2	*Two classes take the mathematics test, namely classes A and B. Class A consists of 30 students, and class B consists of 40 students. The average mark math test of class B is 3 more than the average mark of class A. If the combined average of the two is 78.5, what is the average grade of class A*

3.1. Decision Making Process of Prospective Mathematics Teachers I(S1) in Improving LOTS to be HOTS Problems

3.1.1. Generating ideas Generating ideas

The following are excerpts of the interview in generating idea of S1.

Based on the interview above, S1 generates ideas by looking at the characteristics of Bloom's Taxonomy characteristics at the C4 level (analysis). To get the components, S1 converted the problems into a known all average and then looked for the average of one group of students. Figure 2 presents the ideas.

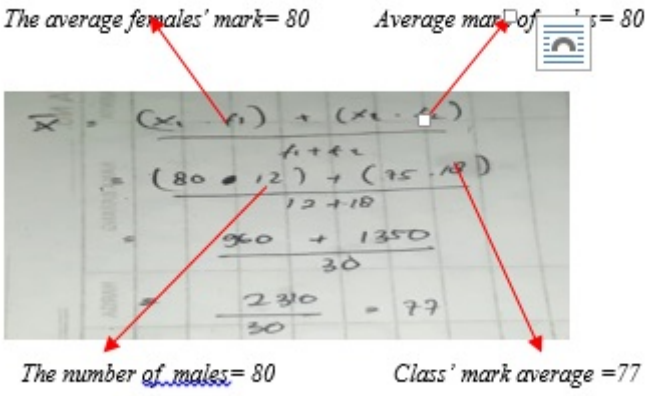


Figure 2: The process of finding a class average.

There are three problems generated by S1. S1 changed the problem with what was known to be what was asked, which was giving problems that were known for the class average, the number of female students, the number of male students, and the known average of one group of students. By

adding a condition that the average of female students the average value of male students, S1 asked to determine the average student in each group. After that, a further problem was asked about the comparison between the average male and female. S1 also developed question ideas about the percentage of students who had mark more than 75. The generating ideas of S1 are presented in Figure 3.

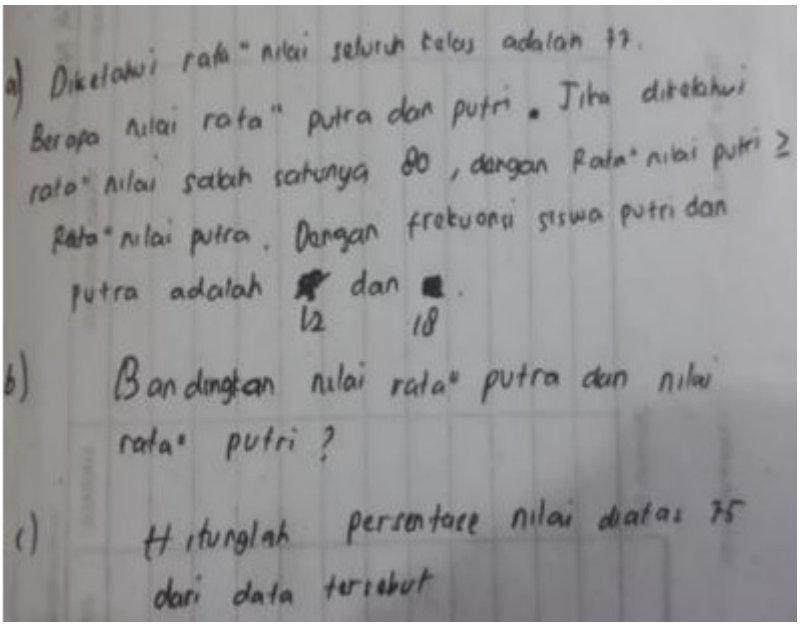


Figure 3: The ideas generated by S1.

Translation

a. The average mark of a class is 77. What is the average mark of female students and male students? If the average mark of one is 80, the average mark of girls $\geq$ the average value of boys, the frequency of girls and boys student are 12 and 18.

b. What is the ratio of the average mark for male and female.

c. Calculate the percentage of mark above 75 from the data.

3.1.2. Clarifying ideas Clarifying ideas

The three ideas were sequential problems where problems 2 and 3 were sequels to problem 1. S1 believed that the problem required a critical thinking stage in understanding the problem and solving it in their ways.

Furthermore, at this stage, S1 then chose problems no.1 and 2, which would be considered as HOTS problem that would be given for junior high school level where students would be more confused. Still, on the other hand, students would be able to reason or think analytically in working on the problems. While in this case, the third question was not used because it was too difficult to find the answer. Related to stimulus, S1 did not add the complexity of the story that led to contextuality that was close to their lives.

3.1.3. Assessing the reasonableness of idea Assessing the reasonableness of idea

Associated with the criteria for the preparation of HOTS type problems, S1 did not pay much attention to the aspects related to the development of questions, for example, Basic Competence,

suitable operational verbs. S1 only focused on the material and level of difficulty. In addition to the data exposure, the S1 decision-making pattern as follows in Figure 4.

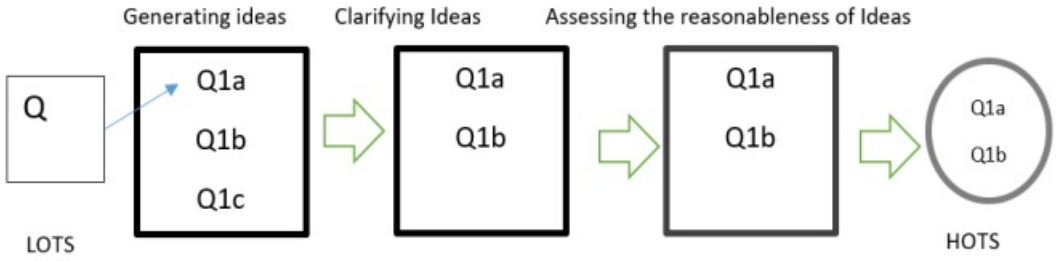


Figure 4: A pattern of decision making of S1.

3.2. The Decision-Making Process of Prospective Mathematics Teachers II (S2) in Improving LOTS to be HOTS Problems

3.2.1. Generating Ideas Generating Ideas

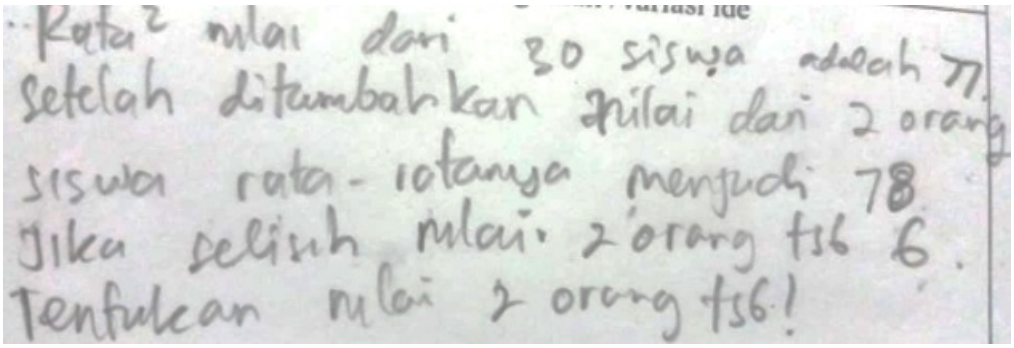


Figure 5: (a)

Tranlation

The mark average of thirty students is 77. After adding the value of two students, the average becomes 78. If the difference in the mark of two students is 6, determine the value of these two students

Translation

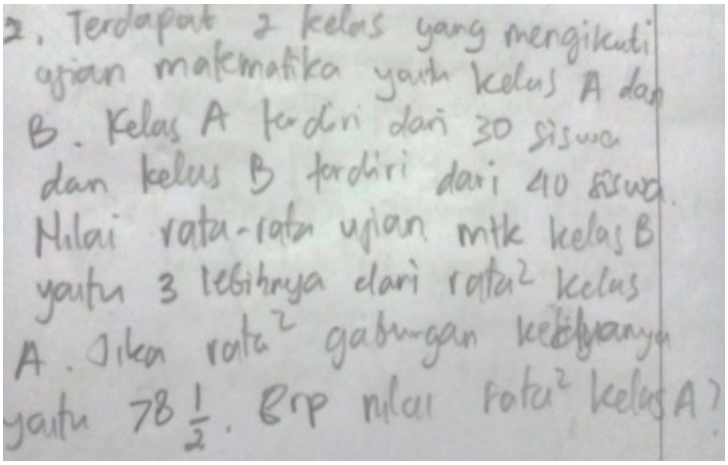
Two classes take the mathematics test, namely A and B. Class A consists of 30 students, and class B consists of 40 students. The average mark of class B is 3 greater than the average mark of class A. If the combined average of the two classes is 78.5, what is the average mark of class A

Translation

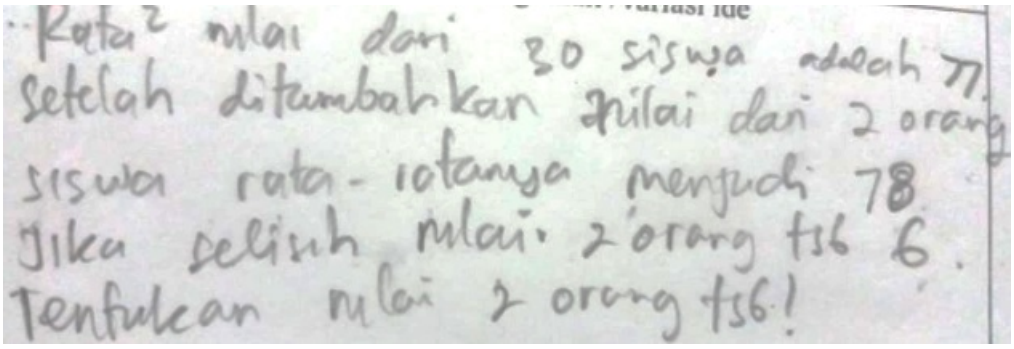
Thirty students who took the test obtain average mark of 77. Two days later, there are additional participants with a mark of 88. How many participants should be added so that the average will become 78.

Fig 5.a, 5.b. 5.c. The Problems developed by S2.

Based on the interview, the first idea developed by S2 was by finishing first the class average of 30 students (12 females + 18 males) and got a combined average of 77. This idea arose based on references that were explored by S2 so that S2 added a component of the problem by adding 2 people who were known to have an average difference of 6 and a new average of 78. The question raised



(b)



(c)

was to determine each of the two people's marks. The second idea developed by S2 presented the context of the mathematics test by taking the number of students in class A namely 30, but S2 did not calculate the combined average.

In this case, S2 added one class B, which had an average of 3 more than class A average, and it was known that the combined average of class A and B was 78.5. The problem being asked was the average mark of mathematics tests in class A. The third idea was built by changing the context, namely, test. The number of students combined between male and female students was 30, while the combined average was sought and obtained 7. Furthermore, some students with mark 88 were added, and the students were asked to determine the number of new participants so that the average was 78.

3.2.2. Clarifying Ideas Clarifying Ideas

According to the interview, the idea of the problem was at the level of analysis because in problem no 1, the problem asked for an analysis of the difference in mark of 2 people, namely 6. S2 chose number of 78 randomly as a new average and chose a difference of 6. For problem number 2, students were asked to analyze the average portion of class B, which was 3 more than class A. It required the creation of a mathematical model of the problem. S2 chose randomly 78.5 as the combined average. S2 said that the problem was an analytical problem. Problem number 3 asked to find the number of people that had to be added so that the combined average was 78. When choosing the name, 78 was the combined average. Furthermore, S2 chose these three problems because they met the criteria

of HOTS problems, which required analysis stage and different ideas for completion. S2 continued on the three problems on evaluating the reasonableness of the ideas by testing whether the three problems could be solved or not.

3.2.3. Assessing the reasonableness Ideas Assessing the reasonableness Ideas

At this stage, S2 did not analyze in detail the concepts involved in solving the problem, whether it had already been taught or not. S2 only focused on whether the problem could be solved or not with the knowledge they had. The problem was the improvement of a combined average with a basic formula. Next, S2 assessed the reasonableness of the problem by trying to find the answer.

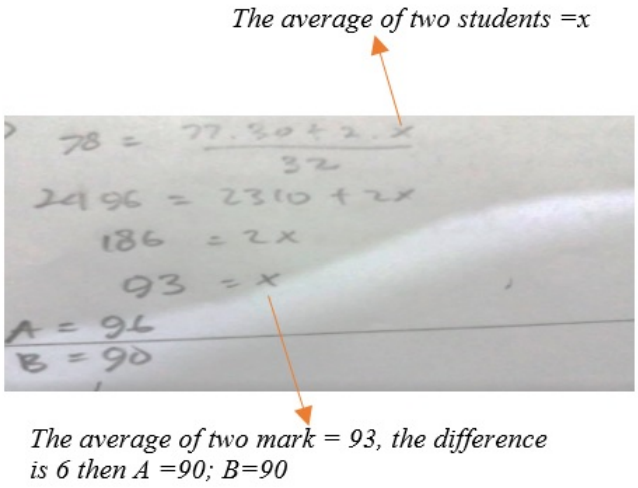


Figure 6: The results of S2 work on HOTS I.

From the interview with S2, it was found that initially, the two marks were considered the same and supposed x and the basic formula of the combined average of two groups were put together, and the mark of x was 93. Because the difference between the two marks was 6, intuitively, the student's mark I was 96 and the student mark II was 90 and totaled 186. Thus, this problem was a problem that could be solved.

Interview with S2 described the average mark of class A with variable a and the average mark of class B, namely (a + 3). This is because the average mark of class B was 3 more than the average of class A. By completing the basic formula of combined average, it was found that the average mark of class A was 76.3. Thus, problem number two could be a HOTS problem that could be solved.

Based on the interview with S2, the number of additional participants was represented in variable a. By substituting the basic formula of the combined average and doing algebraic manipulations, the number of other participants was 3 people. Thus, the third problem was a HOTS problem that could be solved. However, after seeing the results of the work, it seemed that S2 believed that the problem was too easy.

S2 chose problem number 2 from the three problems, because students were asked to make a new mathematical model from the existing formula. From this description, the pattern of the S2 decision-making process.

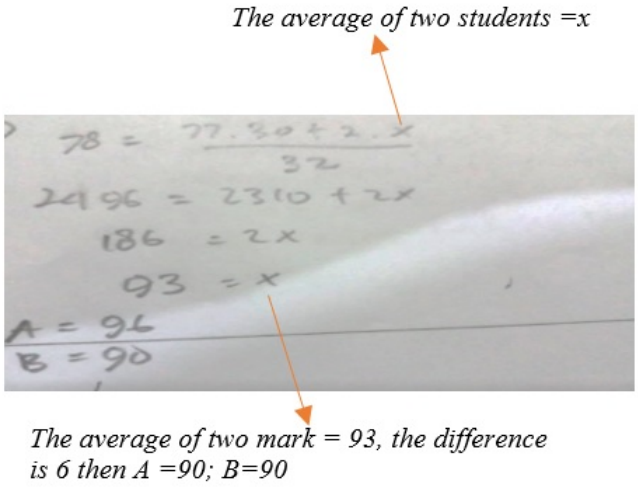


Figure 7: The results of the work on HOTS II.

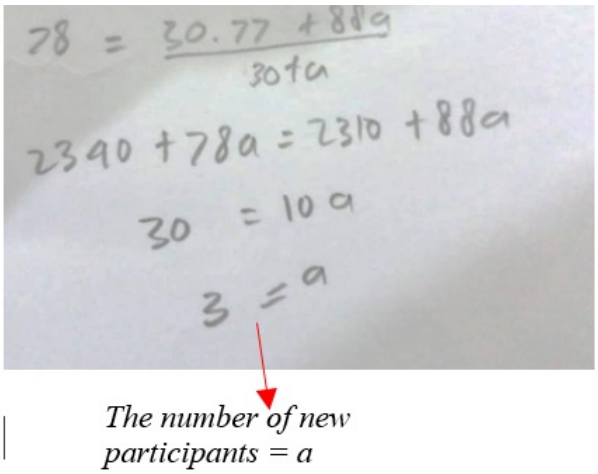


Figure 8: Results of work on HOTS III.

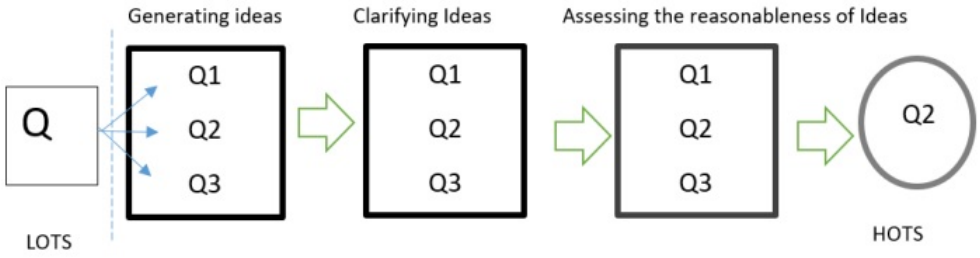


Figure 9: A Pattern of S2 decision making.

4. Discussion

At the stage of generating ideas S1 and S2 choose the level of analysis in Bloom's taxonomy, where at this stage, students were asked to differentiate, organize and attribute the given problem [5], [18]. Both S1 and S2 generated ideas by finding a combined average first and adding the variable

to increase the level of the problem at the level of analysis. Both students generated ideas from the subject's personal experience, searching the internet, without regarding necessary competencies before and after the material provided. It was because they did not have teaching experience in the actual classroom. This was certainly different than the decision making of teachers that had been well-honed. [17] conveys that each prospective teacher's decision based on memories or schemes from previous experience, pedagogical knowledge, content knowledge, as well as beliefs and preferences.

In the decision-making stage, which involved choosing a stimulus to the problem; however, the complexity raised was still relatively low. Differences influenced it in teaching experience, where S1 had the experience of giving private lessons, whereas S2 did not have experience. Both S1 and S2 did not design problems at the evaluation or creative level. The pedagogical knowledge of the teacher, including the selection of appropriate teaching strategies, did not only depend on the teacher's knowledge of the subject matter but also the teacher's knowledge of the level of student understanding [22]. Both subjects did not change or develop the story context in the problem, only adding to the complexity of the content. S1 decided to choose two sequential problems, that looking for the average of one group and continued to find the average comparison, while the third question was not tested because it was considered too difficult. S2 chooses all generated problems and then evaluate the answers. The ability of subjects to determine the complexity of writing HOTS problems required mastery of teaching materials, skills in writing problems, and teacher creativity in choosing stimulus problems under the situation and conditions of the area around the education unit [28].

S1 was intuitively sharper in choosing one or two ideas at the stage of clarifying ideas because S1 had more experience in giving private lessons, whereas S2 was less sure of selecting an idea at the stage of clarifying ideas. It based on the different confidence factors between the two subjects. Bishop and Whitfield stated that "their values play a big role in decision making, for example, their beliefs about the nature of people and the nature of subject matter." In this way, Bishop and Whitfield see the teacher's decision as something special [8].

5. conclusion

Based on the results and discussion. The conclusion says that the prospective teachers have different patterns (ways) in making decisions in improving LOTS problems to HOTS. The prospective teacher chooses three problems that are summarized in one complex problem when generating ideas. The problems discussed in the analysis stage refer to the revised bloom taxonomy. At the scene of clarifying ideas, the first prospective teacher is less able to explain the level of analysis itself and chooses two of the problems raised and assessed for later on the reasonableness of the HOTS problem selected. When assessing the reasonableness of ideas, this prospective mathematics teacher checks whether the problem can be solved or not. The prospective math teacher did not consider the basic competencies associated with the problems produced well.

The second perspective teacher can generate three separate HOTS problems at the stage of generating ideas with modifying the story to make complexity to the stimulus problems. In the stage of clarifying ideas, the second student is not able to explain in detail the characteristics of the analysis level, but the problem involved the analysis skill. To assess the reasonableness of her ideas, S1 chooses three problems from the previous stage. This subject assesses the reasonableness of the ideas by checking the possibility of solving the problem but pays less attention to the essential competencies involved in the problems. The chosen problem is decided after evaluating the reasonableness of the idea by considering the complexity factor of the problem.

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