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Analysis of junior high school national examination year 2014 to 2017 on facilitating students' high order thinking skill

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Abstract. One of the thinking skills of students who are being talked about by various groups in the general public and education is higher order thinking skills (HOTS). In Bloom's taxonomy, HOTS is a student's ability to answer questions with a level of analyzing, evaluating, and creating. One form of test that is presented by the implementation standard of assessment in Indonesia is the National Examination. Regarding this matter, the analysis of HOTS content on the national examination tool is an urgent matter to do. This study aims to determine the contents of HOTS in the National Examination of Junior High School Mathematics subjects in 2014 to 2017. This research is a descriptive study with a qualitative approach. Data was collected with non-tests given to several experts. Sources of data obtained by researchers came from their own researchers, 2 mathematics teachers, and 3 mathematics lecturers. In the validity of the data and decision making, it is obtained from the quantity of opinions from the six experts. The results showed that the HOTS items from 2014 to 2017 were different. The number of HOTS items in the National Examination from 2014 to 2017 were 12, 16, 18 and 10. However, from the HOTS items in 2014 to 2017 there were no questions about type C6, namely creating.

1. Introduction

National Exam is an annual event that has become a liability for the student-level end of each level of education in Indonesia. For participants who are obliged to follow the National Examination generally are students who have been studying for six years, for elementary school, students who have been studying for nine years, for Junior High School, as well as students who have been studying for 12 years for Senior High School. But does not require the possibilities there are those who follow the school package A, B, or C who take part in the National exams.



National exam is an activity that already take place since year 1950 - now with different names [1]. In practice, the problems differ between tested annually. However, at the time of the curriculum in 2013 has not been initiated by the government, the National Exam has different characteristics in terms of item construction and graduation [1]. One difference, for example it can be seen that there is a minimum value of graduation for each lesson. In this case, the government set a minimum value of the end of the graduation for students at each educational level is 5.5 with a maximum scale of 10 with the provisions of the minimum value of each subject was 4.0 with a scale up to 10 anyway. The final value is referred to here is a combination of Madrasah / School Examination score and the National Examination score [2]. However, this policy has been amended by the new policy on the national exam.

The national exam which recently contains compulsory and elective subjects where compulsory subjects for all levels of education are Indonesia Language and Mathematics. Lately very intensively once discussed about the issues that measure HOTS students. One of the topics of discussion is the National Examination questions. Implementation issues at the National Exam HOTS very helpful in facilitating the ability of the student HOTS. Because in essence an individual at a very educational environment requires the ability HOTS [3]. HOTS is also a skill that is needed in mathematics learning. This is also supported by research which states that in learning mathematics, HOTS is important. This is because HOTS develops students' ability to analyze, evaluate, and create, so that students will have the ability to think critically and think creatively in solving problems in their daily lives [4].

HOTS includes several abilities, namely critical thinking, creative thinking, meta-cognition, and reflection [5]. HOTS also include skill such as creative and critical thinking, analysis, problem solving, and visualization [6] Learning to use HOT questions provides learning that is not routine / not fully known beforehand, the problems given tend to be complex problems, the results obtained will provide varied solutions or come from various points of view. This includes the uncertainty, a process that is awarded to students over the process that makes them feel meaningful learning, and in doing it requires very hard thinking and mental work [1].

The question of HOTS is related to one of Bloom's theories, Bloom's Taxonomy. The existence of this theory began when in his research, Benjamin Bloom found that 95% of the questions, from the three levels of the question sheets studied, were questions that had a low cognitive level [7]. From these studies Bloom and her friends, from the psychology of education, based on educational goals created three different domains namely psycho-motor, affective, and cognitive. However, for the psycho-motor domain was not developed by Bloom and colleagues. They only focused on the cognitive and affective domains. The domains are divided into several levels of ability terraced namely knowledge, comprehension, application, analysis, synthesis and evaluation [8]. However, the level of ability that has been mentioned is a bloom taxonomy level of ability in older versions. The level of ability in bloom taxonomy is the latest version are remember, understand, apply, analyze, evaluate, and create. The difference from the old version and the revised version is more fully described in the following figure [9]

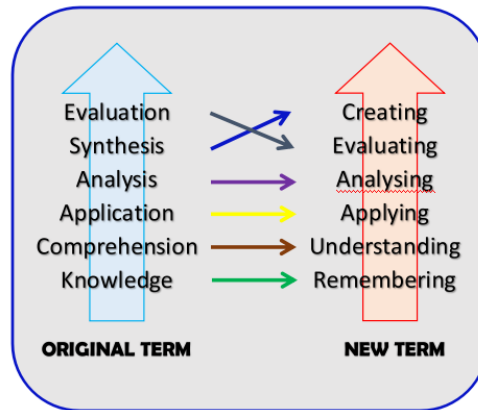


Figure 1. Differences Bloom's taxonomy of old and new versions

From figure 1, the significant difference can be seen from the editorial differences of each level. Then, it can be seen that the level of long bloom taxonomy capabilities, the evaluation at the level of the sixth or the last stage with the previous stage of the synthesis stage. However, at the level of the new bloom taxonomy capabilities, stage of evaluation at the level of the fifth and final level is created. More will be described the sense of each level capabilities bloom revised taxonomy in figure 2 below [9]:

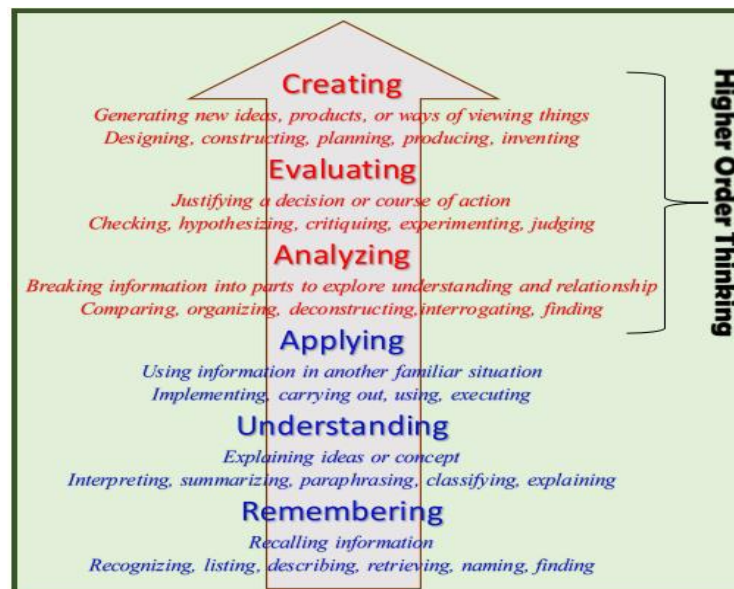


Figure 2. Explanation of each level of the bloom's Taxonomy

From the figure above, a bloom taxonomy Based on a revised, turns in it there is content that included the ability HOTS is Analyze the level of capability that C4, C5 is Evaluate, and C6 is create. According to Fisher (2010; 375) besides the three levels that fall into the HOTS category, the other three levels are C1 that is remembering, C2 is understanding, and C3 is applying is part of Lower-Order

thinking Skills (LOTS) [10]. In other words it means HOTS is the highest part in Bloom's taxonomy of domain of cognitive [11]

The above explanation meant that HOTS is important to develop the potential of students in Indonesia in particular. it is important to examine how the charge HOTS on National Exam. Therefore, in this study will be discussed thoroughly about the content HOTS on National Exam 2014 to 2017. In the selected starting from 2014 due to the policy in 2013, especially in contrast to the policy of the National Exam in 2014 to 2017 were almost the same.

2. Research methodology

The method used descriptive qualitative research in phenomenology. Data collection techniques used in this research was by using a questionnaire. Conclusion of the subscription taken based on the number of selections from each of the respondents of the grouping of C1 through C6 to the Mathematics National Examination year 2014 to 2017.

3. Research result and discussion

Mathematics is one of national examination lesson in Indonesia. The mathematics question is little more than other lesson i.e. 40 questions. We have known 6 categories should be reached by students based on bloom's taxonomy. We will see the data of C1 to C6 in mathematics national examination question year 2014 to 2017 in the following table 1.

Table 1. Contents of Mathematics National Exam year 2014 to 2017 based on Bloom's Taxonomy

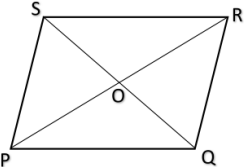
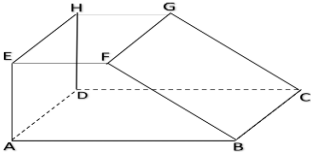
Year	C1	C2	C3	C4	C5	C6
2014	2	4	22	9	3	0
2015	1	6	17	15	1	0
2016	0	6	16	11	7	0
2017	1	8	21	9	1	0

We can get information from table 1 about categories that contain in mathematics national exam question. We know that base on theory C1 to C3 include LOTS [10] and C4 to C6 include HOTS [9]. based on the table, we know that LOTS question is more dominant than HOTS. LOTS questions in every year contain more than 20 questions. Indeed in 2017, amount LOTS questions was 30. So we can say that The ability of High Order Thinking Skills Indonesian students in junior high school students are still lacking especially facilitated in a given National Exam. It can be seen from table 1 that each of the years from 2014 to 2017, about HOTS question to facilitate the students HOTS at the National Examination is still very low. It can be seen in 2014, HOTS content only amounted to 12 items with details of 9 items included in the C4 category, namely the level of analysis. As for the evaluation level, that is C5, only some 3 problems. And items for category C6, to create, is none in item of 2014 National Exam questions.

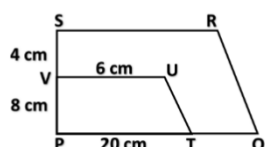
Furthermore, from Table 1 above gives us information that in the next year viz. in 2015 the number of items for C4, C5, and C6 are respectively 15, 1, and 0. The difference with the previous year, about C4 relatively more but for about C5 tend to be less and still the same as in 2014, the category of C6 is not already on the point about the National Exam in 2015. In 2016 and 2017, the content of C4, C5 and C6 are 11, 7, 0 and 10, 1, 0. The questions on the National Exams after 2014 and 2015 are still the same, the C6 category is still not included in the National Examination questions. This leads to the ability of students in the creation is still very low, because the National Examination were still yet to be measured. There are unique from the National Exam 2016 i.e. C5 content, evaluate, tend to be more compared to the previous years and the years thereafter. It becomes an increase for level measurement in evaluating student HOTS.

The level of applying, evaluating, and creating is still not fully included in the National Examination questions. This is evident from 2014 to 2017, HOTS content is still below 50% of the National Examination numbering about 40 items. Meanwhile, the grain sample HOTS level that existed at about the National Exam in 2014 epidemic can be seen in Table 1 below:

Table 2. Item National Examination year 2014 - 2017 in the category C4

Year	C4
2014	<p>22. Look at the stretched image on the side! Many congruent triangular pairs are ...</p> <p>A. 4 B. 5 C. 6 D. 7</p> 
2015	<p>27. The shadow of a tower is 15 m long and at the same time a pile has a shadow length of 3 m. if high-pile 7 m, the height of the tower is ...</p> <p>A. 19 m B. 22 m C. 25 m D. 35 m</p>
2016	<p>27. Watch the following prism picture!</p>  <p>EF = 8 cm long, AB = 16 cm, AE = 15 cm, and BC = 9 cm. The surface area of a prism is ...</p> <p>A. 864 cm² B. 900 cm² C. 1.100 cm² D. 1.200 cm²</p>

- 2017 28. Look at the following picture!
PTUV trapezoid is in line with the PQRS trapezoid.



The area of the PQRS trapezoid is ...

- A. 117 cm^2 C. 234 cm^2
B. 210 cm^2 D. 468 cm^2

In Table 2 above, the matters included in the category C4 more on issues which is the application of geometry. Test items were selected, most respondents said that such questions into the category of C4 due in working on such questions, requiring analysis in advance. So, the students can not work if they are not able to analyze what is known of some information that is implied. In addition, the existing problems is the application of a concept that has been given during the learning process. So, to resolve these issues, they require an existing concept by analyzing the problem so they can find what concepts that they will use to solve the problem.

The next category in the National Exam is C5 category or evaluate level. As the information on the table 1 that has been described above, for this content is still very little. There are only at most 15% of items are included in the C5 category. it also just happened a year that is in 2016, but only 5% for the years 2014, 2015 and 2017. Examples of items for the category C6 at about the National Exam in 2014-2017 can be seen in Table 3 below:

Table 3. Item National Examination year 2014 - 2017 in the category C5

Year	C5
2014	<p>12. Look at the following statements!</p> <p>i. $9ab + 21ac = 3a(3b+7c)$</p> <p>ii. $x^2 - 9 = (x - 3)(x + 3)$</p> <p>iii. $3p^2 - p - 2 = (3p-2)(p-1)$</p> <p>The true factorization are ...</p> <p>A. <i>i, ii</i></p> <p>B. <i>i, iii</i></p> <p>C. <i>ii, iii</i></p> <p>D. <i>i, ii, iii</i></p>
2015	<p>10. Read the following statement!</p> <p>I. $4x^2 - 9 = (2x + 3)(2x - 3)$</p> <p>II. $2x^2 + x - 3 = (2x - 3)(x+1)$</p> <p>III. $x^2 + x - 6 = (x + 3)(x - 2)$</p> <p>IV. $x^2 + 4x - 5 = (x - 5)(x + 1)$</p> <p>The true statements are ...</p> <p>A. I and II</p>

		B. II and III C. I and III D. II and IV
2016	15.	Read the following statement! I. $4x^2 - 9 = (2x + 3)(2x - 3)$ II. $2x^2 + x - 3 = (2x - 3)(x + 1)$ III. $x^2 + x - 6 = (x + 3)(x - 2)$ IV. $x^2 + 4x - 5 = (x - 5)(x + 1)$ The true statements are ... A. I and II B. II and III C. I and III D. II and IV
2017	26.	Watch the following picture! (1) $c^2 = b^2 - a^2$ (2) $c^2 = a^2 - b^2$ (3) $b^2 = a^2 + c^2$ (4) $a^2 = b^2 - c^2$ The true statement are A. (1) and (3) B. (2) and (4) C. (2) and (3) D. (3) and (4)

Table 3 above contains examples of questions that go in level or category C5. The questions were given each year tend to be similar in terms of determining the truth value of a revelation. However, for 2017 the given problem more on the concept given to the students. Here, at the level of five students are required to master the concepts of each material. If students do not understand the concept, then they will not be able to resolve the problems that exist. Besides the concept, they also need to be able to know what information is in the problem. If students understand the information and understand the concepts that exist, then students will be able to answer questions correctly and accurately. For example in the matter of the National Exam in 2017, students who simply memorize the mathematical concept of the theorem phytagoras that $a^2 + b^2 = c^2$ would have difficulty in answering the type of questions there. However, those who understand the concept of phytagoras would easily work on the problems that there are.

We have already seen in table 1, that for the category of C6 or creative level, from 2014 to 2017 was not one. This is why the ability to create student can not be measured by using about the National Exam. Thus, the ability can be measured in the National Examination 2014 to 2017 only focused on assessing only C1 to C5 category. Although national examination question was not really facilitate student in HOTS, we as a teacher should know more about HOTS questions. Because based on research, not all teacher well in understanding HOTS [12].

4. Conclusions

About the National Examination in 2014 up to 2017, about the matter covered by that level C1, remembering, C2 is understanding, i.e. applying C3, C4 is analyzing, and C5 are evaluating. For C6 level that is creating yet no one questions that represent the National Examination 2014 to 2017. So, for about HOTS there are only C4 and C5. The number of National Examination questions containing HOTS has a different number for each year. In 2014, the number of items to the level of C4 and C5 are 9 and 3 items. As for the level of C4 and C5 in 2015 respectively 15 and 1 item. For 2016, items for the C4 level is 11, and this year, about the level of C5 more than a year before or after as many as 7 items. In 2017, the number of items on the C4 decrease from 2015 and 2016, namely to 9 items. As for the matter C5 item because only one such matter in 2015 of each year, to the level of C6 is still not at all, so many grains of the matter is 0.

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