Analysis of Middle School/MTS Mathematics National Examination (UN) in 2017-2019 Based on Higher Order Thinking Skills (HOTS) Perspective

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ABSTRACT

The National Examination is used as a standard from the government to test the feasibility of a student to be able to continue their education to a higher level and as equal distribution of education nationally. This refers to the ability of Indonesian students who are still ranked at the bottom if international level measurements are taken, namely in PISA and TIMSS. The purpose of this study was to analyze the elements of the 2017-2019 SMP / MTs National Mathematics Exam questions based on the HOTS perspective and compare the development of the number of questions that meet the HOTS perspective from 2017-2019. The method used in this research is descriptive method of document analysis. Data collection techniques in the form of documentation and interviews of several resource persons in the field of mathematics education. This analysis technique consists of three components: data reduction, data display, and data verification. The results of this study indicate that the UN questions that meet the HOTS perspective of the material covered that most often come out are geometry. The results of the analysis show that the National Examination in 2017 was 17.5%, the 2018 UN was 17.5% and the 2019 UN was (20%). These results indicate the number of HOTS questions on the SMP/MTs Mathematics UN questions has increased.

Keywords: National Examination, Higher Order Thinking Skills

Introduction

The Indonesian education system in all regions from one region to another has different levels of competency standards. For this reason, the government requires educational standards to equalize competence in all regions, namely by holding a National Examination (UN) at the end of education at the SMP/MTS and SMA/MA levels. The National Examination is used as a standard from the government to test the feasibility of a student to be able to continue their education to a higher level and as an equal distribution of education nationally (Sulistiawan, 2016; Syahida & Irwandi, 2015). In Permendikbud No. 3 of 2013 article 23 paragraph 2 which reads: "Implementation of the Central Level drafts the UN questions based on Competency Standards and Basic Competencies in Content Standards in accordance with the Regulation of the Minister of National Education Number 22 of 2006". In administering the National Examination, the National Education Standards Agency (BNSP) has decided on the National Standard Agency regulations regarding the grid for National Examination questions for Primary and Secondary Education Units. The questions contained in the National Examination must be based on the grid or Graduate Competency Standards (SKL) set by BNSP (Maisaroh & Falah, 2011).

A test in the learning outcomes instrument must measure students' skills at changing levels, from low-level thinking to higher-level thinking. So that the proportion of item questions on a test must be considered. According to the revised Bloom's taxonomy, thinking skills in the cognitive domain are divided into six levels, namely: remembering (C1), understanding (C2), applying (C3), analyzing (C4), cultivating (C5), and creating (C6) (Yusuf & Widyaningsih, 2018). The first three levels (bottom) namely C1, C2 and C3 are *Lower Order Thinking Skills* (LOTS), while the next three levels, namely C4, C5, and C6 are *Higher Order Thinking Skills* (HOTS) (Yusuf & Widyaningsih, 2018; Lailly & Wisudawati, 2015). According to Gunawan (Lailly & Wisudawati, 2015) Higher order thinking skills are thought processes that require students to manipulate existing information and ideas in ways that provide them with new insights and implications.

However, in Indonesia, the question instrument in the test tends to only be on the ability to memorize and apply the formula in its completion which is still at a low level of thinking and not yet at a high level of thinking.

Higher order thinking skills (HOTS) are a component of creative thinking skills and critical thinking (Heong, Othman, Yunus, & Kiong, 2011). In addition, HOTS is a thought process that requires students to manipulate existing information and ideas in certain ways that give them new insights and implications. (Lailly & Wisudawati, 2015). HOTS enables students to be more independent and creative learners, proficient in problem solving and able to use scientific content in everyday contexts. (Hugerat & Kortam, 2014).

In addition, the results of the 2013 National Examination Convention (UN) held by KEMDIKBUD decided that in determining graduation to increase the credibility and reliability of the UN, in the future the UN measures a higher cognitive domain (higher order thinking) (Budiman & Jailani, 2014). Training students to be skilled can be done by the teacher by practicing characteristic questions HOTS (Budiman & Jailani, 2014). To support this, it is impossible for teachers to simply move the material in the textbook but they must look for other, more weighty references. The problem faced by teachers is that the teacher's ability to develop HOTS assessment instruments is still lacking, besides that there is no assessment instrument specifically designed for training HOTS (Budiman & Jailani, 2014).

As an effort to optimize thinking skills, it can be done by improving the quality of UN questions. Improving the quality of the National Examination questions can be pursued by increasing the degree of difficulty of the questions or by raising the passing standards. Increasing the degree of difficulty of the questions is closely related to an increase in the number of high-order thinking skills questions on the National Exam. Knowing the role of the National Examination can be a benchmark for improving the quality of education, researchers are interested in knowing how much the contribution of higher-order thinking skills in the UN and to find out differences in the quality of UN questions based on aspects of higher-order thinking skills that they measure.

Based on the above background, the researcher is interested in conducting descriptive research with the title "Analysis of Middle School Mathematics National Exam Questions for 2017-2019 Based on the Perspective of Higher Order Thinking Skills. (HOTS)".

Literature Review

National Examination

The national exam is one way to measure students' abilities during their education (Lailly & Wisudawati, 2015). The National Examination is also a tool to measure how far students have mastered the subject matter that has been studied during a certain period of time (Maisaroh & Falah, 2011). In law number 20 of 2005 states that the national education system aims to measure the achievement of competency of graduates in national subjects which refers to the competency standards of graduates.

Based on government regulation number 32 of 2013 concerning national education standards, Article 68 explains that the results of the national exam are used as one of the considerations for four things, namely: mapping the quality of programs and / or educational units, as the basis for selection for the next level of education, as a determinant of graduation students from programs or educational units, and as guidance and assistance to educational units in an

effort to improve the quality of education. The results of tests and assessments can be used as an indication of the success of education, National Examination as an external assessment can be used as a measure of educational success because the results are most easily visible (Maisaroh & Falah, 2011).

Article 11 Permendikbud Number 023/2016 also describes the assessment mechanism carried out by the government. In this article, it is explained that the results of the National Examination are submitted to the education unit to be used as input in improving the learning process and conveyed to interested parties as the basis for: mapping the quality of programs or educational units, consideration of selecting the next education level, as well as coaching and providing assistance to education unit in an effort to improve the quality of education. Giving tests that will measure the attainment of students' knowledge and skills will have a positive impact, especially for students because their knowledge and skills will automatically be more trained and competent, while national examination teachers can be used as a means of reflection. about achieving learning objectives more broadly (Maisaroh & Falah, 2011).

Higher Orde Thinking Skill (HOTS)

HOTS, which in Indonesian is known as high-order thinking skills, is an approach in learning where students are taught to think critically, logically, reflectively, metacognitively, and think creatively (Iskandar & Senam, 2017). This ability to think will appear when individuals or students are faced with problems they have not encountered before (Yusuf & Widyaningsih, 2018). According to Lailly & Wisudawati, (2015) explaining high-order thinking skills can occur when a person associates newly received information with information that is already stored in his / her memory, then reconnects and develops the information so that a solution is reached of a situation that is difficult to solve.

King (Iskandar & Senam, 2017) HOTS categorizes as follows: (1) critical thinking and logical thinking, (2) reflective thinking, (3) metacognitive thinking, and (4) creative thinking. HOTS includes aspects of critical thinking skills, creative thinking skills, and problem solving skills (Lailly & Wisudawati, 2015). Critical thinking is the ability to analyze, create and use criteria objectively, and evaluate data. Creative thinking, namely the ability to use complex thinking structures so as to generate new and original ideas. The ability to solve problems is the ability to think in complex and deep ways to solve a problem.

HOTS questions are arranged based on the level domains C4, C5, and C6 which are formulated in the question indicators (Yusuf & Widyaningsih, 2018). How to evaluate students' HOTS can be done by measuring in several ways, namely (1) selecting (multiple-choice, matching, and rank-order items), (2) generalizing (short answers, essays), and (3) giving reasons (Iskandar & Senam, 2017). Test instruments that are usually used in schools and colleges usually only cover the cognitive domains C1 to C4, so that students' higher order thinking skills are less developed (Yusuf & Widyaningsih, 2018). The ability to solve HOTS questions is very important in developing students' critical thinking skills (Iskandar & Senam, 2017).

Research Methods

The method used in this research is descriptive method of document analysis. The descriptive method of document analysis was chosen as the research method because the data collected in this study came from the SMP/MTs Mathematics National Examination (UN) questions for the 2016/2017, 2017/2018 and 2018/2019 academic year.

The data source in this study is about the types of higher order thinking skills or Higher Order Thinking Skills (HOTS) in the Mathematics UN SMP / MTs questions for the 2016/2017, 2017/2018 and 2018/2019 academic year. However, it is limited to only 1 question package in each academic year analyzed. Data collection techniques in the form of documentation and interviews of several sources. Interviews were conducted with several expert sources such as lecturers, namely Dr. M. Syaifuddin and mathematics subject teacher, namely Achmad Mutaqin, S.Pd.

The data analysis technique used is descriptive narrative using the Miles and Huberman model. This analysis technique consists of three components: data reduction, data display and data verification. Data reduction in this study is to classify SMP / MTs National Mathematics Exam questions for the year 2017-2019 based on the HOTS perspective. Reduction data are presented in the form of narrative text, tables and graphics. While the validity of the data in this study was carried out by using triangulation of sources.

Results and Discussion

The data collected from the results of the documentation study of the Mathematics National Examination questions for the 2016/2017, 2017/2018 and 2018/2019 academic years has taken one sample in each academic year, which are the characteristics of the Higher Order Thinking Skill perspective measured in each question. Based on the results of the research, the number of questions that meet the three HOTS characteristics is consistent in 2017-2018 while in 2019 the number has increased, this can be seen in Table 1. UN results in 2017 were 17.5%, in 2018 UN were 17, 5% and at the 2019 National Examination (20%). These results indicate the number of HOTS questions on the SMP / MTs Mathematics UN questions has increased. Of all the questions that meet the HOTS perspective, geometric material is the largest in number compared to numbers, algebra and statistics. The results of research conducted by Qoni'ah, (2017) Based on the analysis, the National Examination in 2013 was 3 questions, in 2014 it was 5 questions and in 2015 it was 4 questions, the number of questions that fulfilled the three HOTS characteristics was not so many. Based on the results above, in 2017 there was an increase compared to previous years, then increased again in 2019. These results are in line with the 2017 national exam results report by the Education Assessment Center of the Ministry of Education and Culture's Balitbang which stated that the implementation of the UN SMP / MTs 2017 school year adopting several international standard questions from the Program for International Student Assessment (PISA) with the aim to improve the quality of the questions as well as to familiarize students with thinking at a high level and the PISA questions submitted in the 2017 National Examination (Memolo, 2017).

Table 1. Results of the Analysis of the Mathematics Middle School National Examination Questions that meet HOTS

Butir Soal yang Memenuhi HOTS			Jumlah			Presentase		
2016/2017	2017/2018	2018/2019	1	2	3	1	2	3
17, 19, 23, 25, 29, 31, dan 38	14, 17, 20, 25, 29, 38, dan 40	5, 12, 18, 20, 21, 28, 31, dan 39	7	7	8	17,5%	17,5%	20%

So that the comparison and development of UN questions that meet the HOTS perspective can be seen more clearly through the graph below.

Figure 1. SMP Mathematics National Examination Questions that Meet HOTS

In the results of the analysis of the 2017-2019 Mathematics UN questions, several questions were found with the material that always appears every year that meet the HOTS perspective such as in the material for the set of 2017 Mathematics UN questions number 19 as follows.

19. Suatu regu pramuka beranggotakan 25 orang. 12 Orang membawa tongkat, 15 orang membawa bendera semapur, dan 6 orang tidak membawa keduanya. Jumlah anggota yang membawa kedua alat itu adalah
- 2 orang
 - 8 orang
 - 21 orang
 - 27 orang

Figure 2. National Examination Questions 2017 Material Association

Then in the 2018 Mathematics UN question number 20 has the same type of material as the one above, which is as follows.

20. Wawancara dari 40 orang pembaca majalah diketahui 5 orang suka membaca majalah tentang politik dan olahraga, 9 orang yang tidak menyukai keduanya. Banyak pembaca yang menyukai majalah olahraga sama dengan dua kali banyak pembaca yang menyukai majalah politik. Banyak pembaca yang menyukai majalah politik adalah ...
- 8 orang.
 - 10 orang.
 - 12 orang.
 - 14 orang.

Figure 3. National Examination Questions 2018 on Association Material

Problems with the same type of material in the 2019 Mathematics National Examination have similarities with the 2017 Mathematics UN, which are as follows.

18. Pada acara kerja bakti kebersihan kelas dan lingkungan, sebanyak 18 anak membawa sapu, 24 anak membawa kain lap, dan 5 anak membawa peralatan lain. Jika banyak siswa dalam kelas tersebut 34 anak, banyak siswa yang membawa sapu dan kain lap adalah
- 3 anak
 - 8 anak
 - 13 anak
 - 16 anak

Figure 4. National Examination Questions 2019 on Association Material

This shows that there are still similarities in varying the types of UN questions from year to year. In the guideline for drafting international standard questions by the Ministry of Education

and Culture (2015), it is explained in the writing technique section of HOTS items that must pay attention to the scope of material required for the education level which consists of numbers, algebra, geometry and statistics to be used as basic knowledge or skills in solving problems available and it is recommended to provide various kinds of data as a stimulus in questions. This is still different from the results of research where there are still many questions that do not have a stimulus but only measure the ability to remember students with a lack of number of UN questions that meet the HOTS perspective, even though in 2019 it has increased to 20% so this needs to be considered again by the question maker. In line with this Syahida & Irwandi (2015) perkiraan aspek yang diukur pada soal UN mengacu pada tujuan pendidikan ranah kognitif Taksonomi Bloom, aspek yang berhubungan dengan kemampuan intelektual dan kemampuan berpikir, seperti mengingat atau menyelesaikan suatu masalah. Masih rendahnya proporsi HOTS pada naskah soal UN Matematika yang dianalisis, maka dapat dikatakan naskah soal tersebut belum mampu mengukur kemampuan berpikir tingkat tinggi / Higher Order Thinking Skill (HOTS) siswa.

Based on research results Qoni'ah, (2017) which is shown in Figure 1 the number of HOTS questions from the 2012/2013 to 2014/2015 academic year has a different number, but for the 2017-2019 Mathematics National Examination there has been an increase of 7-8 HOTS questions from previous years. Based on the above, the HOTS UN Mathematics SMP has progressed although not significantly. This is in accordance with what was stated Dempster, (2012) in his research which aims to compare the demands of the 2004 Mathematics examination manuscript in Kenya, Zambia, Ghana, and South Africa. In the results of his research, he argued that the number of questions that required categories of cognitive processes to analyze, evaluate and create or think critically and creatively on exams in several countries was very small. Even so, the number of questions is still insufficient to be able to measure students' ability in higher order thinking.

The reason for the slight emergence of cognitive aspects of critical and creative thinking on exam questions, especially the UN is influenced by the form of the instrument used (Syahida & Irwandi, 2015). In the UN, the instrument used is the UN questions which are a type of objective test in the form of multiple choices. Although multiple choice questions make it possible to measure the cognitive aspects of students' skills at various levels, it is as revealed by Lan & Chern, (2010) that the cognitive level of critical and creative thinking aspects is quite difficult to test through multiple choice questions, this is because both are more productive skills.

Conclusion

Based on the results of research and discussion, it can be concluded that the elements of each UN question that meet the HOTS perspective, namely the characteristics of the stimulus, the characteristics of critical thinking and the characteristics of creative thinking, which are then classified as each of the UN questions as HOTS if they meet the three characteristics and after studied, the UN results in 2017 were 17.5%, the 2018 UN was 17.5% and the 2019 UN results (20%). These results indicate the number of HOTS questions on the SMP / MTs Mathematics UN questions has increased. The results of this study indicate that the UN questions that meet the HOTS perspective of the material coverage that most often come out are geometry.

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