Analysis of High Order Thinking Skill (HOTS) in joint midterm examination at YAPNUSDA Elementary School

F B Sole[1] and D M Anggraeni[2]

[1]Primary Education, STKIP Weetebula, Sumba Barat Daya, Indonesia
[2]Physic Education, STKIP Weetebula, Sumba Barat Daya, Indonesia

Corresponding author: ferdi.bele@stkip-weetebula.ac.id

Abstract. This research aims to analyze and describe aspects of HOTS (High Order Thinking Skills) in the joint exam questions used by YAPNUSDA Elementary Schools. It was conducted by analyzing cognitive aspects according to revised Bloom's taxonomy and then analyze again with HOTS aspects that have been determined in the joint exam test questions. The research method used is descriptive research method with a qualitative approach. The research team describes the development of HOTS on objective test questions in natural sciences (IPA) grades III, IV, V and VI respondents involved were a team of teachers making up science questions, grades III, IV, V and VI. The data collection technique used is the documentation study. Documentation studies are used to identify and analyze the compatibility of questions with HOTS development criteria. The results of this study indicate that joint midterm examination questions in Elementary Schools under the auspices of YAPNUSDA have not been able to measure HOTS. The joint midterm examination questions compiled by the drafting team at each school measure the most Low-Order Thinking Skills (LOTS) and only a few can measure Middle Order Thinking Skills (MOTS).
Keywords: *high order thinking skill, joint midterm examination*

1. Introduction

In the technical guide thematic learning integrated ministry of education and culture to explain that teachers should teach to students of the ability or the skills to think critically or Higher Order Thinking Skills (HOTS), with the aim of improving the ability of students to think of reason to answer questions that are more complicated and or solve a case of a more complicated problem. The implication is that learning designed by teachers must train students to think critically and solve problems and measure their achievements through HOTS instruments.

High order thinking skills as a critical thinking skills, logical, reflective, metacognitive, and creative. These capabilities will develop when people have problems that are not familiar, uncertainties, or a new phenomenon that requires solutions that have never been done before [1]. Some capabilities that are included in the assessment HOTS are: (1) problem solving ability, (2) decision making [2]. HOTS, such as logical thinking, critical thinking and reasoning skills are the basic skills for daily life, apart from the academic achievements in the schools [3].

Higher order thinking conceived of as the top end of the Bloom's cognitive taxonomy. The teaching goal behind any of the cognitive taxonomies is equipping students to be able to do transfer. "being able to think" means students can apply the knowledge and skills they developed during their learning to new contexts. "New" here means applications that the student has not thought of before,

not necessarily something universally new. Higher order thinking is conceived as students being able to relate their learning to other elements beyond what they had been taught [4].

The characteristics of HOTS are: (a) non-algorithmic, meaning that action steps cannot be fully determined at the beginning; (b) complex, meaning that the steps cannot be seen or guessed directly from a particular point of view; (c) produce many solutions; (d) involve dissent or interpretation; (e) involves the application of multiple criteria; (e) involves uncertainty; (f) demanding independence in the thinking process; (g) involves impressive meanings; (h) requires hard work (effortful). The characteristics of tasks that require HOTS are: (a) not routine (not known before); (b) complex; (c) produce many solutions or points of view; (d) involves uncertainty; (e) involves the process of making meaning; (f) assessed effort and requires mental work. So, we can conclude that the characteristics of tasks that require HOTS are: (a) the steps to solve them are not directly predictable and cannot be determined completely at the beginning; (b) not a routine; (c) there are many solutions; (d) requires hard effort [5].

According to Indonesian ministry of education and culture regulation No. 21 of 2016 concerning Basic and Secondary Education Content Standards it is stated explicitly that learning outcomes in the realm of knowledge follow Bloom's Taxonomy which has been revised by Lorin Anderson and David Krathwohl [6], [7] consisting of ability: knowing (C1), understanding (C2), applying (C3), analysing (C4), evaluating (C5), and creating (C6). HOTS questions generally measure the ability in the realm of analyzing, evaluating, and creating. In the selection of operational verbs to formulate indicators about HOTS, it should not be trapped in the grouping of operational verbs. For example, the verb "determine" in Bloom's Taxonomy lies in the realm of C2 and C3. In the context of writing HOTS questions, the verb "determine" may be in the realm of C5 (evaluating) if to determine the decision is preceded by the thought process of analyzing the information presented on the stimulus then the students are asked to determine the best decision. Even the verb "to determine" can be classified as C6 (creative) if the question demands the ability to devise a solving strategy new problems. So, the realm of operational verbs is greatly influenced by what thought processes are needed to answer the questions given.

Bloom's thinking skill is divided into two categories that is lower order thinking skills which consists of knowledge, understanding and application. Higher order thinking skills which consists of analysis, synthetic and evaluation [8]. Description and key word of each category can be seen in table 1. Problems HOTS is a measurement instrument used to measure the ability to think critically, the ability to think that not only recall, restate, or refer without processing (recite). HOTS questions in the context of the assessment measure the ability of: 1) transferring one concept to another, 2) processing and applying information, 3) looking for links from different information, 4) using information to solve problems, and 5) analysing ideas and information critically [9]. Despite this, the questions are based HOTS not mean a more difficult matter than about the recall.

In preparing HOTS questions generally use stimulus. Stimulus is the basis for making questions. In the HOTS context, the stimulus presented should be contextual and interesting. Stimulus can be sourced from global issues such as information technology, science, economics, health, education, and infrastructure issues. Stimulus can also be raised from the problems that exist in the environment around the education unit such as culture, customs, cases in the area, or various advantages that are found in certain areas. A teacher's creativity greatly influences the quality and variety of stimuli used in writing HOTS questions.

The preparation of HOTS questions is part of the duties and responsibilities of teachers as implementing education. Likewise, the teachers at the Nusa Cendana Education Foundation (YAPNUSDA). In the midterm examination Elementary Schools under the auspices of YAPNUSDA carry out joint examinations where one question compiled by the foundation's drafting team will be used by all Elementary Schools. This midterm exam questions compiled by the team will be analysed to find out the high order thinking skills.

Table 1. Description and keyword of Bloom's taxonomy revision.

Category	Keywords	
Remembering: can the student recall or remember the information*?*	Mention the definition, imitate the pronunciation, state the structure, pronounce, repeat, state	LOTS (Lower Order Thinking Skill)
Understanding: Can the students explain the concept, principle, law or procedure?	Classify, describe, explain the identification, place, report, explain, translate, paraphrased.	
Applying: Can students apply their understanding in new situation?	Choosing, demonstrating, acting, using, illustrating, interpreting, arranging schedule, making sketch, solving problem, writing	
Analysing: can students classify the sections based on their difference and similarity?	Examining, comparing, contrasting, distinguish, doing discrimination, separating, test, doing experiment, asking	HOTS (Higher Order Thinking Skill)
Evaluating: can students state either good or bad towards a phenomenon or certain object?	Giving argumentation, defending, stating, choosing, giving support, giving assessment, doing evaluation	
Creating: can students create a thing or opinion?	Assemble, change, build, create, design, establish, formulate, write	

2. Literature review

2.1. Characteristics of HOTS Questions

HOTS questions are highly recommended for use in various forms of classroom assessment and school exams. Some characteristics of HOTS questions are as follows:

2.1.1. Measuring higher order thinking skills. Higher order thinking skills are processes: analysing, reflecting, giving arguments (reasons), applying concepts to different situations, composing, creating. The ability to think at a higher level is not the ability to remember, know, or repeat. Thus, the answers to HOTS questions are not explicitly stated in the stimulus. The ability to think at a high level includes the ability to solve problems (problem solving), critical thinking skills, creative thinking, the ability to reason (reasoning), and the ability to make decisions (decision making) [10]. The ability to think at a higher level is one of the important competencies in the modern world, so it is a must for every student. Creativity solves problems in HOTS, consisting of:

- Ability to solve unfamiliar problems;
- The ability to evaluate the strategies used to solve problems from a variety of different perspectives;
- Kind new settlement models that are different from previous methods.

In preparing HOTS questions, it is important to understand that 'difficulty' is not the same as higher order thinking. The level of difficulty in the item is not the same as the ability to think at a higher level. For example, knowing the meaning of an uncommon word might have a very high degree of difficulty, but the ability to answer these problems does not include higher order thinking skills. Thus, HOTS questions are not necessarily problems that have a high degree of difficulty.

2.1.2. Contextual problems. HOTS questions are assessment based on real situations in daily life, where students are expected to be able to apply learning concepts in class to solve problems. The characteristics of contextual assessment based on authentic assessment are as follows. a) Learners construct their own responses, not just choose the answers that are available; b) Tasks are challenges

faced in the real world; c) The assignments given not only have one particular answer that is correct, but allow many correct answers or all correct answers.

2.1.3. Using various question. Forms of questions that can be used for example multiple choice, complex multiple choice (true / false or yes / no, short or complete answer, short / short answer, and description.

2.2. Joint Midterm Examination YAPNUSDA Elementary School

Midterm examination with schools under the auspices of the Nusa Cendana Education Foundation are carried out based on a cooperation agreement between the Government of Southwest Sumba Regency in this case the Office of Education, Youth and Sports with the Chairperson of the YAPNUSDA Management Board. In the agreement, it was explained that YAPNUSDA provided an opportunity to compile its own midterm examination and midterm examination questions that applied to all Elementary Schools under the auspices of YAPNUSDA.

3. Research method

In this research, the type of research used is qualitative field research. Qualitative method is one method to describe and uncover phenomena or events that occur in the field naturally. While the research design used in this study is a descriptive research design. The research was conducted in Elementary Schools under the auspices of YAPNUSDA in the West Sumba, South western Sumba and Central Sumba Regency. When the study is March to December 2019. Focus of this study was to identify the use of HOTS in terms of joint midterm examination of YAPNUSDA primary school. The data collection technique used is documentation. The documentation activity was carried out to analyze the suitability of the joint midterm examination questions that had been prepared by the teacher team and the HOTS indicator. The data analysis technique in this study uses Miles and Huberman's model data analysis techniques, namely data analysis which is carried out directly and continuously until it is completed, so that the data is already saturated. The steps in the analysis of this data are: Data Reduction, Data Display (Presentation of data) and conclusions.

4. Results and Discussion

The research activity was begun by coordinating and communicating with the Chairperson of the YAPNUSDA Board of Trustees named Father Marselinus Pingge Lamunde, Pr. This communication is intended to discuss the technical implementation of the joint midterm examination conducted by all Elementary Schools under the auspices of YAPNUSDA. Implementation of joint midterm examination begins with the formation of the implementing committee by the head of the YAPNUSDA office. Furthermore, the schools assigned to compile the questions will form a question drafting team in each school according to the determined subjects. After the question drafting team completes their tasks, the school principal will deliver the question soft files to the YAPNUSDA office to be duplicated. The questions that have been duplicated will be distributed to all YAPNUSDA Elementary Schools to be tested together. The results of the joint examination will also be analyzed jointly by the entire YAPNUSDA School.

Communication and coordination is also carried out with leaders and employees at the YAPNUSDA office. This communication is intended to provide an overview of the planned research activities and also to obtain data about schools that compile the joint midterm examination questions contained in the decree. Details about the list of schools that compose the joint midterm examination questions can be seen in the decision letter for the implementation of the midterm examination school year 2018/2019 attached to this report. In addition, this activity is also intended to obtain data about midterm examination questions that have been compiled by the drafting team in each school.

After conducting coordination and communication with the chairman of the board, YAPNUSDA leaders and employees, the activity implementation team conducted interviews with the drafting teachers about UTS together with the 2018/2019 school year in 4 schools namely SDK Mareda Wuni,

SDK Homba Karipit, SDK Bondo Lenga and also Waikabubak SDK. The details of the division tasks for each schools can be seen in the table 2.

Table 2. Division task of preparing examination question.

No	School	Curriculum	Class
1	SDK Mareda Wuni	KTSP	III
2	SDK Homba Karipit	KTSP	V
3	SDK Bondo Lenga	KTSP	VI
4	SDK Waikabubak III	K-13	IV Themes 6 and 7
		K - 13	V Themes 6 and 7
		K - 13	VI Themes 6 and 7

Based on the table 2, it is known that the joint midterm examination questions at YAPNUSDA Elementary School are divided into two applicable curricula, namely KTSP and K-13. The description of the analysis of the results of this study is divided into two broad sections namely reviewed based on revised Bloom's taxonomy and based on the level of thinking skills.

4.1. Analysis Results Based on Bloom's Taxonomic Revision

Based on the results of the analysis that has been done, it is obtained that in general, the questions of midterm examination with Elementary Schools under the auspices of YAPNUSDA are still largely limited to the cognitive level of knowing (C1) and understanding (C2). There are only a few items that fall into the category of applying (C3). Details of the data analysis results in the class that uses the education unit level curriculum (KTSP) in terms of the revised Bloom taxonomy can be seen in the following figure 1.

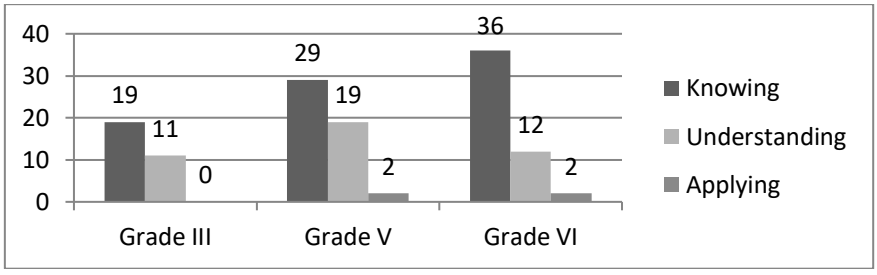

Figure 1. Data analysis result at the class use KTSP.

The detailed data on the results of the joint midterm examination test for classes using the 2013 Theme 6 curriculum in terms of Bloom's taxonomy can be seen in the figure 2.

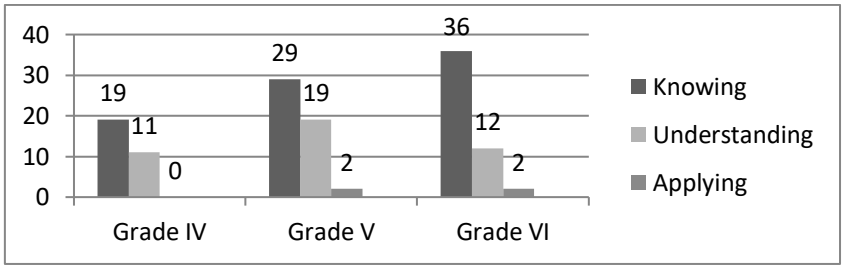

Figure 2. Data analysis result at the class use 2013 curriculum theme 6.

While the details of the data analysis results of joint UTS questions on classes using the 2013 Theme 7 curriculum in terms of Bloom's taxonomy can be seen in the figure 3.

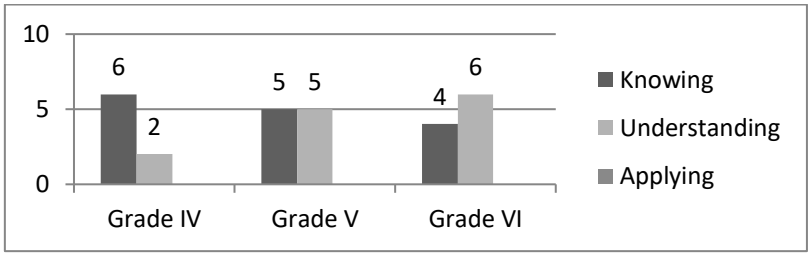

Figure 3. Data analysis result at the class use 2013 curriculum theme 7.

4.2. Analysis Results Based on Thinking Skills.

Based on thinking skills, data analysis results are divided into 3 categories namely Lower Order Thinking Skills (LOTS), Middle Order Thinking Skills (MOTS) and Higher Order Thinking Skills (HOTS). Summary of the results of the joint midterm examination question analysis based on thinking skills in schools that use KTSP can be seen in the figure 4.

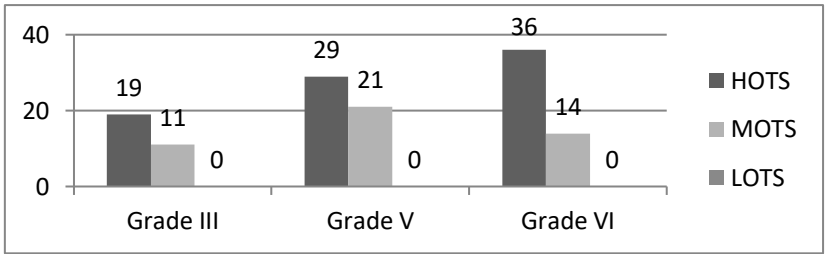

Figure 4. Data analysis result based on thinking skill at the class use KTSP.

Based on the table above it is known that the midterm examination questions with Elementary Schools under the auspices of YAPNUSDA who use KTSP are in the category of LOTS and also MOTS. There are not of the midterm examination questions have been used to measure HOTS. This finding also occurs in the joint midterm examination Question that is used by schools implementing the 2013 curriculum. Most of the questions are at a low level of thinking skills. There are not question has been used to measure high- level thinking skills. In class IV only 3 items were used to measure intermediate thinking skills. The description of the results of the analysis of the questions based on the level of thinking skills in the YAPNUSDA Elementary School that applies the 2013 curriculum can be seen in the figure 5.

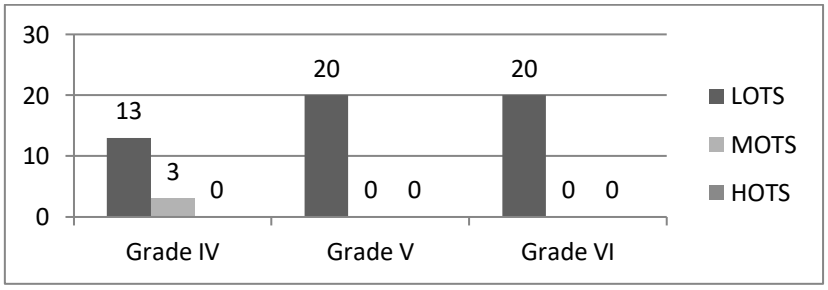

Figure 5. Data analysis result based on thinking skill at the class use 2013 curriculum

5. Conclusion

Based on the description of the results of the study above, it can be concluded that the joint midterm examination questions in Elementary Schools under the auspices of YAPNUSDA have not been able to measure Higher Order Thinking Skills (HOTS). This condition occurs in questions compiled using KTSP and Curriculum 2013. Joint midterm examination questions compiled by the drafting team at

each school measure the most Low Level Thinking Skills (LOTS) and only a few can measure Middle Level Thinking Skills (MOTS).

References

[1] King F J, Goodson L, and Rohani F 1998 *Higher Order Thinking Skills: Definitions, Strategies, Assessment* (Tallahassee, Florida: Center for Advancement of Learning and Assesment) pp 1
[2] Arter J A and Salmon J R 1987 *Assessing Higher Order Thinking Skills: A Consumer's Guide* (Washington, DC: Test Centre of the Northwest Regional Educational Laboratory) chapter 3 pp 3
[3] Marshall J C and Horton R M 2011 *School Science and Mathematics* **111** 93-101 http://dx.doi.org/10.1111/j.1949-8594.2010.00066.x
[4] Brookhart S M 2010 *How to Assess Higher Order Thinking Skills in Your Classroom* ed G Wymond (Alexandria: ASCD) pp 5
[5] Resnick L B 1987 *Educational and Learning to Think* (Washington, DC: The National Academy Press) pp 3-7 https://doi.org/10.17226/1032
[6] Anderson L W and Krathwohl D R 2001 *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives* (New York: Addison Wesley Longman) pp 77-80
[7] Krathwohl D R 2002 *Theory Into Practice* **41** 212-18 https://doi.org/10.1207/s15430421tip4104_2
[8] Schraw G 2011 *Assessment of Higher Order Thinking Skills* ed D H Robinson (Charlotte, NC: Information Age Publishing) pp 4-10
[9] Heong Y M, Othman W D , Yunos J M, Kiong T T, Hassan R and Mohamad M M 2011 *International Journal of Social Science and Humanity* **1** 121-25 https://doi.org/10.7763/IJSSH.2011.V1.20
[10] Australian Council for Educational Research 2015 *Developing Higher Order Thinking Skills*. (Melbourne: ACER) chapter 1 pp 5