

## Geography Teachers' Skills in Developing HOTS-Oriented Assessment Instruments in Metro City

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### ABSTRACT

HOTS-oriented assessment is to improve students' high-level thinking skills in the classroom. The purpose of this study is to determine and analyze the skills of geography teachers in developing HOTS-oriented questions both theoretically and practically. The results show that their skills are theoretically and practically low. Teachers' training to improve their competence in developing HOTS-oriented assessment instruments is necessary.

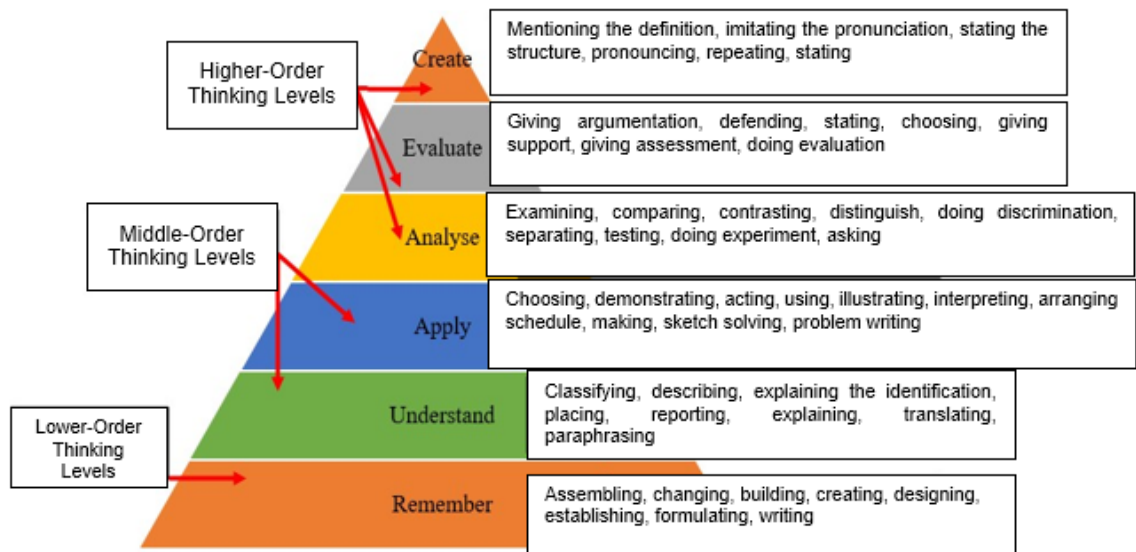
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### INTRODUCTION

In the early decades of the twenty-first century, the education system must cope with the increasing pressure in responding to new demands of assessment (Koomen & Zoanetti, 2016). In education, the term "assessment" refers to various techniques or tools used by teacher-educators for evaluating the students' learning progress or educational needs (Alam & Aktar, 2019). It is the main feature of teaching and curriculum, strongly framing how students learn and what students achieve (Boud & Associates, 2010). Assessment deals with the process to evaluate the effectiveness of teaching activities carried out within the framework of assessment results (Acar-Erdol & Yıldızlı, 2018; Gallavan, 2009). As a part of class activities, it is a fundamental process to promote learning and achievement (Upahi, Issa, & Oyelekan, 2015). The main purpose of the assessment is to determine the extent to which the expected learning outcomes have been achieved (Olorundare, 2014).

Learning methods should manage to engender student enthusiasm in learning (Pusung, Ratu, & Rotty, 2020), however, there is a growing recognition that a good assessment improves learning (Black & William, 1998; Hattie, 2012; Hattie & Timperley, 2007). Assessment is one of the most needed parts of the educational process where student learning is measured by a variety of procedures (Köksal & Ömer, 2018). Good assessment requires an exam paper that covers different cognitive levels to accommodate students' diverse capabilities (Jones, Harland, Reid & Bartlett, 2009; Köksal & Ömer, 2018). The cognitive domain in Bloom's taxonomy is set to confirm the cognitive level of students (Haris & Omar, 2015). It discusses the knowledge and development of intellectual skills (Bloom, 1956). Bloom's Taxonomy, which was developed in 1965 by Benjamin Bloom, is a standard and hierarchical model that classifies educational learning goals based on the level of complexity and specificity (Boslaugh, 2019; Dorim'e-Williams & Shults, 2019).

He created the taxonomy concept to make students aware of what they are learning, so they strive to achieve a more sophisticated level of learning portrayed in the six categories of cognitive learning. It focuses on developing thinking skills involving the acquisition of simple information for more complex processes (Bloom, 1956; Shukran & Manaf, 2017). Then, this cognitive taxonomy was revised by his students named Anderson, and Krathwohl. The revised Bloom's taxonomy consists of three higher levels: analyzing, evaluating, and creating (Clark, 2010; Saido, Siraj, Nordin, & Al\_Amedy, 2015). Figure 1 presents the cognitive taxonomy by Anderson and Krathwohl (2001).



**Figure 1. Taxonomy of the Cognitive Domain**

The first three categories of Bloom's taxonomy (knowledge, comprehension, and application) measure students' lower levels of thinking skills (LOTS), while the other three levels (analysis, synthesis, and evaluation) measure higher levels of thinking skills (HOTS) (Chang & Mao, 1999; Pappas, Pierrakos, & Nagel, 2012; Yahya, Toukal, & Osman, 2012). In Bloom's revised taxonomy, the three higher levels are analyzing, evaluating, and creating (Clark, 2010; Saido et al., 2015). This study domain refers to HOTS-oriented assessment. It is defined as transferring, critical thinking, and problem-solving (Brookhart, 2010). The categorization of HOTS-oriented assessments or questions is presented in Table 1.

**Table 1. Cognitive Taxonomy**

Cognitive Categorization and Process	Other Terms	Definition
<b>Analyzing</b> – Breaking material into its constituent parts and detecting how they relate to one another and to the overall structure or purpose.		
1. Differentiating	Breaking down, sorting, focusing, selecting	Distinguishing between relevant and irrelevant material

2. Organizing	Recognizing the coherence, integrating, outlining, describing roles, structuring	Determining how the elements work or function in an overall structure
3. Attributing	Deconstructing	Determining viewpoints, ray, value, or meaning behind the learning materials
<b>Evaluating</b> – Making judgments based on criteria and standards		
1. Checking	Coordinating, detecting, monitoring, examining	- Discovering mistakes in a process or product - Finding out the effectiveness of adopted procedures
2. Critiquing	Giving assessment	- Discovering inconsistencies between a product and its external criteria - Determining the product's external consistency - Finding out the accuracy of the procedure to solve problems
<b>Creating</b> – Putting elements together to form a novel, coherent whole or make original products		
1. Generating	Formulating hypothesis	Formulating hypotheses based on the criteria
2. Planning	Designing	Planning procedures to finish tasks
3. Producing	Constructing	Creating products

Source: Anderson & Krathwohl (2010:100-102)

The cognitive taxonomy categories can also be classified in the assessment instrument which is based on the level of thinking skill. An item or a question is categorized as LOTS if goes to the C1 level (remembering). It is categorized as MOTS if refers to the C2 level (understanding) and to the C3 (applying). If a question refers to C4 (analyzing), C5 (evaluating), or C6 (creating), it falls into HOTS. Among all three assessments, the domain selected in this study is HOTS-oriented assessment. The purpose of this study is to determine and analyze the skills of geography teachers in developing HOTS-oriented questions theoretically and practically.

## RESEARCH METHOD

This is a qualitative descriptive study. The descriptive methodology is used to explain the skills of teachers to develop HOTS-oriented questions both theoretically and practically. The study was conducted in Metro City, Lampung Province. Interviews, observations, and study documentation are used as data collection techniques. The subjects of the study consist of 11 geography teachers from 6 public senior high schools in Metro City. The object of this study is the HOTS-oriented measurement instrument. Descriptive percentages are used in analyzing the data.

## RESULTS AND DISCUSSION

The results of this study describe the skills of geography teachers' HOTS-oriented assessment both theoretically and practically. The results and discussion of this article are presented as follows:

### Theoretical Skills in Developing HOTS Questions

To obtain the results, each geography teacher was interviewed. The results of the interviews are presented in Table 2.

**Table 2. Theoretical skills od HOTS Questions**

Respondents	The Interview Results
A	"I do not understand about HOTS learning and assessment because I have never attended training related to it."
B	"I do not understand about HOTS learning and assessment, and I have not participated yet in training related to it."
C	"I do not understand and comprehend yet about HOTS-based learning and assessment. Due to the time constraint, we appointed a representative, such as the Chief of Geography Teacher Association (MGMP), to attend any training related to it, if it is any, in Metro City."
D	"HOTS-based learning, in my opinion, is a high-level of thinking in learning, for example, problem-solving, while HOTS-based assessment is based on C4, C5, and C6. Regarding the HOTS training, I have participated in HOTS training from the Education Office of Lampung Province, but this year I only participated once as a representative of MGMP in Metro City."
E	"I want to apply HOTS-based learning and assessment, but by considering the students' condition, actually I have never participated in HOTS training. In my opinion, if the students are logical, it is the sign that they are already able to accept HOTS questions..."
F	"I have participated in HOTS-oriented assessment training, but only once, and I have not understood yet how actually HOTS-oriented assessment is..."
G	"I have never implemented HOTS-based assessment in my learning evaluation, but I have a slight understanding about HOTS assessment, but I often use LOTS and MOTS-based questions in my learning evaluation..."
H	"I understand LOTS and MOTS-based assessments, but related to HOTS-based learning, I don't understand..."
I	"I do not understand HOTS-oriented assessment and learning because I have also never attended HOTS-oriented training..."

Respondents	The Interview Results
J	"I have never attended HOTS-oriented assessment and learning training. I usually only make questions based on books for the learning evaluation, and I do not understand whether the questions are included in HOTS or not..."
K	"I know about HOTS-oriented assessment, but I don't really understand about the assessment, and I have never implemented it in the evaluation of learning..."

Source: Field Observation (2020)

The interview results conclude that their theoretical skills are relatively low. Most of them do not understand the constructs of HOTS-oriented assessment, which was influenced by several factors including training. It influenced their pedagogical competence in developing measurement instruments. Martinet, Raymond & Gauthier, 2001, p. 22) stated that no finalized model is used today to describe the deliberate development of professional practice, but rather a series of questions about knowledge and competencies required that are accessible through training.

#### Practical Skills in Developing HOTS Questions

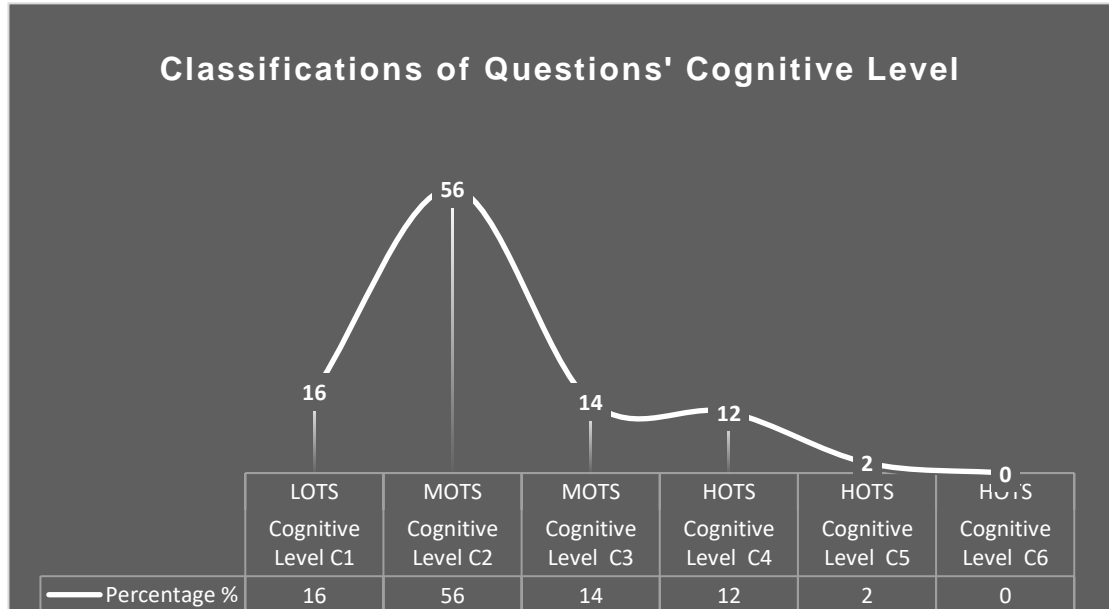
To obtain the data, documentation studies were conducted for data retrieval. The questions taken are the result of the teachers' deliberations which were used as measurement instruments for the final semester examination of 2019. The data were classified based on the cognitive levels as presented in Figure 2 and Table 3 below.

**Table 3. Classification Details of Questions at Cognitive Level formulated by Geography Teachers in Senior High Schools in Metro City**

Number	Level of Cognitive	Category	Total Questions	Percentage (%)
1	C1	LOTS	8	16
2	C2	MOTS	28	56
3	C3	MOTS	7	14
4	C4	HOTS	6	12
5	C5	HOTS	1	2
6	C6	HOTS	0	0
Total			50	100

Source: Field Documentation (2020)





**Figure 2. Classification of Questions' Cognitive Level**

Source: Field Documentation (2020)

The documentation studies and observations lead to a conclusion that the skill of geography teachers in formulating exam questions falls into Low Order Thinking Skill (LOTS) and Middle Order Thinking Skill (MOTS). The results show that C1 questions (LOTS) are 8 out of 50 items (16%), C2 questions (MOTS) are 28 out of 50 items (56%), and C3 questions (MOTS) are 7 out of 50 items (14%). As for HOTS-oriented questions, C4 questions are 6 out of 50 items (12%), C5 question is 1 out of 50 items (2%), and no question falls into the C6 cognitive level (0%).

This concludes that the questions formulated by the teachers are more likely to belong to the middle order thinking skills (MOTS) (70%), low order thinking skills (LOTS) (16%), and higher-order thinking skills (HOTS) (14%). This also implies the teachers' experience in formulating questions. In general, teachers with more experience tend to apply the cognitive levels in measuring student learning outcomes. This corroborates Uno (2011, p. 64) stating that teacher competence cannot stand alone, but it is influenced by several factors such as educational background, teaching experience, and teaching period.

## CONCLUSIONS

The analysis above concludes that the teachers in developing measurement instruments for evaluating the learning outcomes both theoretically and practically remain low, as the measurement instrument of learning outcomes falls into the middle order thinking skills (MOTS) and low order thinking skills (LOTS). It is actually influenced by several factors such as nonattendance in the regional training to improve their pedagogical competencies.

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