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# Teachers' Formative Assessment: Accessing Students' High Order Thinking Skills (HOTS)

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Through the Ministry of Education and Culture, the Indonesian Government has made improvements towards education standards. One of these is the assessment standard, which refers to international assessment standards primarily related to critical and analytical thinking. In micro the scale, assessment conducted by teachers is expected to be able to improve students' high order thinking skills (HOTS). As a result, the focus of this study is to determine the percentage of HOTS questions contained in formative assessments made by teachers. This research is classified as a descriptive study involving 27 Mathematics teachers in the province of Bali, Indonesia. Each collected item is analysed using the cognitive level of the revised Bloom. The result shows that 9.47% of teachers' questions are categorised as questions which evaluate HOTS dominated by cognitive analysis (C4). This percentage does not meet the criteria of the minimum limit of HOTS questions in national exams of 10-15% or even much lower when compared to HOTS questions in the PISA assessment, which is a minimum of 20%. Furthermore, the interview results indicate that the average teacher does not quite understand the process of compiling HOTS questions. Therefore, HOTS training needs to be improved.

**Key words:** *Formative assessment, high order thinking skills*

## Introduction

Developing students' high order thinking skills is one of the goals of education in the 21st century (Ball & Garton, 2005; Heong et. al, 2011; Lord & Baviskar, 2007) in addition to problem-solving and critical thinking abilities. This ability is very important for student to adapt to in the era of "global chaos" given the rapid changes in information flow. Thinking

ability is the combination of cognitive process and the ability to complete a task (Milvain, 2008). Initially Bloom (1979) identified 3 taxonomies of thinking skills which include cognitive, affective, and psychomotor dimensions although at the cognitive level, they do not make specific references to low-level thinking skills (LOTS) and high-level thinking skills (HOTS) (Tâm & Linh, 2017 ; Scully, 2017). This causes researchers to have their own opinion regarding HOTS and LOTS. Where HOTS and LOTS begin and where they end, each expert has a different opinion. In the cognitive process hierarchy HOTS is the highest level (Yee, et al, 2015; Mahendra, Jayantika, & Sulistyani, 2019) which requires high-level creative thinking and action (Beyer, 1992). LOTS is the basis of HOTS but has a higher complexity of thinking ability. LOTS and HOTS are two dichotomies of thinking ability on a cognitive level that is bipolar or toward two different poles. Unlike the case with intelligence (IQ) which is unipolar. Judging from Bloom's taxonomy (1979) revised results in the cognitive level, from C1 to C6, HOTS is usually included in the level of analysing (C4), evaluating (C5), and creating (C6) while LOTS includes the level of remembering (C1), understanding (C2) and applying (C3) (Anderson & Krathwohl, 2001; Schraw, Gregory, & Robinson, 2011). While seen from the taxonomy of Marzano & Kendall (2007) LOTS is generally classified into the categories of understanding and taking, HOTS is classified into the level of analysis and utilisation. In this paper the taxonomy used to sort students' thinking abilities on a cognitive level is the taxonomy of Bloom (1979) which has been revised by Anderson & Krathwohl (2001).

HOTS can be conceptualised as a non-algorithmic and complicated mode of thinking that often produces several solutions (Barak & Dori, 2009; Resnick, 1992; Pratama & Renawati, 2018). HOTS can be learned and taught and will be active when students encounter unknown problems, uncertainties and dilemmas (Tâm & Linh, 2017). There must be linearity between the learning process, teaching strategies, and assessment (Biggs, 1999; Birenbaum, 2000) to maximise students' HOTS (Momsen, et. al., 2010). HOTS cannot develop if learning is oriented towards examinations (Jones, 2010). Alignment of learning goals, implementation of learning, and assessment towards a higher cognitive level are very important to create a culture of thinking for the teacher in preparing his/her class (Anderson & Krathwohl, 2001). In other words, it is not only the learning strategy that triggers HOTS, but assessment must be able to trigger HOTS, which is alternative assessment. Assessment that can replace the dominance of standardised tests can only measure the mastery of the content of teaching materials. Some suggested alternative assessments include multiple choice, open ended problems, performance tests and portfolios (Tâm & Linh, 2017; Goodson & Rohani, 1998).

In recent years, recognition of the potential role of formative assessment in education has been increased (Scully, 2017) for being able to provide feedback to teachers about the strengths and weaknesses of learning , including providing evaluations about student development. The concept of formative assessment refers to assessments aimed at improving

the teaching-learning process (David, 2007; Bronwen & Beverley, 1999; Hortigüela, Palacios, & López, 2018). This goal should be achieved by using assessments that are able to access students' HOTS. Formative assessment used by Mathematics teachers in Indonesia are still dominated by paper and pencil tests compiled by teachers themselves in the form of multiple choice tests and essays . The test can be used as a formative assessment, although it is less effective in its use. Through the Ministry of Education and Culture, the Indonesian Government has formed a HOTS Technical Guidance Facilitating Team to facilitate teachers in writing questions that are oriented towards high-order thinking skills. In reality, As a form of formative assessment, teacher made tests still rarely measure students' HOTS (Mahendra, Jayantika, & Sulistyani, 2019; Stiggins, 1994). In fact, testing students regarding high order thinking skills can strengthen their cognitive skills (Barak & Dori, 2009).

HOTS questions or assignments have the following characteristics : a) the solution is not predictable or does not use a direct formula, b) it is not routine, c) it is an open solution, d) it requires more work in completing it (Primary & Renawati 2018, Retnawati, et. al., 2017). Several studies have shown that there is a positive relationship between HOTS and students' academic abilities (Tâm & Linh, 2017). Students who have HOTS ability will have better academic abilities than students who have LOTS. As a result, the author is interested in conducting research on formative assessment analysis in the form of teacher-made tests in accessing students' high order thinking skills. Based on the above description , the purpose of this study is to discover the extent to which a teacher's formative assessment is able to access students' high-order thinking skills.

## Literature Review

### *High Order Thinking Skill (HOTS)*

When a teacher understands that teaching is an activity that enables students to understand, not to impart knowledge, then he or she has assisted students to learn at a higher level (Lord & Baviskar, 2007). Of course, such learning includes teaching high-level thinking skills. The thinking ability model was firstly coined by Bloom (1956), with three domains including cognitive (knowledge), affective (attitude), and psychomotor (skills)., Bloom's taxonomy has always been a reference in relation to the ability to think on a cognitive level. This taxonomy is a tool used to design, assess, and evaluate student learning (Lord & Baviskar, 2007). Before being revised on a cognitive level, Bloom's taxonomy consists of: knowledge (C1), understanding (C2), application (C3), analysis (C4), synthesis (C5), and evaluation (C6). Such a cognitive level encompasses the simplest to the most complex, with the assumption that students' learning must go through all stages in a sequence (Hadzhikoleva, Hadzhikolev, & Kasakliev, 2019). Nearly 50 years it has been used as a basis for determining learning objectives, assessment and curriculum development. But when it is revised it changes from

nouns to verbs, namely: knowing (C1), understanding (C2), applying (C3), analysing (C4), evaluating (C5), and creating (C6). At the cognitive level, Bloom's taxonomy revised by Anderson and Krathwohl (2001) is widely used by experts to sort out students' thinking abilities. Within, It can be classified as LOTS in the cognitive domain from C1 to C3 while from C4 to C5 it can be classified as HOTS.

Low-level cognitive ability, remembering (C1) is the ability to retrieve previously learned knowledge from long-term memory in the form of facts, terms, concepts, formulas, and answers that include recognition and recall. Recognising means recalling relevant knowledge in a long-term memory sequence to compare with available information. If recognising is evaluated by assessment in the form of multiple choice, then an example is: how many sides does a hexagon have? a) five, b) six, c) seven, d) nine. Recalling means quickly calling on relevant knowledge in long-term memory sequence . For example, what is the answer to "6 x 9" or "9 x 6"? To answer this, requires quickly summoning knowledge .

Understanding (C2) is the ability to build understanding of facts and ideas, whether oral, written and graphic communication by organising, comparing, translating, interpreting, giving descriptions, and stating main ideas which include interpreting, exemplifying, classifying, summarising, inferring, comparing, and explaining. Interpreting means being able to change information from one form of representation to another. Students are able to explain in words when providing a picture of a graph or vice versa, to make a graph of the information given. For example in a class, the number of male students is half of female students, as a result students are told to translate Maths sentences into Mathematical symbols. Applying (C3) is the ability to use procedures in solving problems in new situations by applying knowledge, facts, techniques, and rules in different ways which include executing and implementing. Executing means using more skills and algorithms than techniques and methods when completing a routine task (familiar). For example, students are told to determine the maker of zeros from the quadratic equation x2 - 5x + 6 = 0. Students solve this problem by choosing the method of factoring, with formulas or perhaps by completing a perfect square. Implementing means choosing and using a procedure to resolve unfamiliar problems. In mathematics, it can be used as an example in managing personal finance.

Analysing (C4) is the ability to solve problems by separating information into certain parts by identifying the causes, detecting relationships with individual parts as well as the whole to make conclusions and support evidence of generalisation, consisting of differentiating, organising, and attributing. Differentiating means distinguishing something relevant from irrelevant information, or something important from unimportant information and being able to show information that is relevant or important. For example, students can distinguish prime numbers and composite numbers. Organising means identifying the elements of

communication or situation and recognising how these elements unite into a coherent structure. For example, students complete a three-variable linear equation system by means of elimination or substitution. Attributing means determining the point of view, bias, value, or intention behind the subject matter. For instance, students are told to count the surface of a quarter-shaped lantern.

Evaluating (C5) is the ability to provide an assessment or retain opinions to make decisions about information, validity of ideas, or quality of work based on criteria and certain standards consisting of checking and critiquing. Checking means re-examining if there are errors in a process or product; discovering the effectiveness of a procedure that is being practiced. For example, in solving problems students use more than one alternative or solution. Critiquing means finding the accuracy of a way or procedure to solve a problem. For instance, choosing the best way to find the set of resolutions of linear equations of 3 variables, whether with OBE (elementary line operation), inverse matrix, Cramer rule, elimination or substitution.

Creating (C6) means being able to compile information in different ways by combining elements in a new pattern that is coherent and functional, or creating alternative solutions that differ from before which includes generating, planning and producing. Generating means making a hypothesis based on certain criteria. For example, a motorbike wash station employs 10 employees, how many motorcycles can you expect to be washed for one year? Planning means planning a procedure to complete a task. For instance, students are assigned to draw the design of a tent camp complete with size. Producing means solving problems outside the plan when meeting certain specifications. After students make a tent, how is the tent designed? Is it pyramid or triangular prism-shaped so that it allows two people to move inside the tent. At first, students design the shape of the tent then construct it in accordance with the provisions given.

Goodson & Rohani (1998) maintain that HOTS involves critical, logical, reflective, metacognitive and creative thinking when students of various ages solve problems that are not routine. When conducting a taxonomic assessment, it is identical to the level of questions when the teacher sets an exam. Therefore, a matter that is classified as HOTS and LOTS can be seen from the operational verbs that are used according to the cognitive level (see again Table 1). Ariffin et. al. (1989) explain that as an intellectual process, thinking skills involves the formation of concepts, applications, analysis or evaluation of information collected through observation, experience, reflection, reasoning or communication. Furthermore, Mohamed & Lebar (2017) reveal that the process of using the mind in making decisions and solving problems is the definition of thinking skills. There are two levels of thinking skills: low level thinking skills (LOTS) and high level thinking skills (HOTS). HOTS has a vital role in improving student learning ability, speed of learning, including the effectiveness of

the learning process (Heong et. a., 2011) so that it leads to an increase in student academic achievement (Ramos, Dolipas, & Villamor, 2013).

***Formative Assessment***

The theoretical base of this study reviews some of the literature from both books and articles about formative assessment. As a valuation approach, formative assessment obtains many key principles from the Western context, especially through the work of scholars in the United Kingdom, the United States and Australia (Chen, et. al., 2013). The difference in point of views about formative assessment lies on the teachers' role, the ability to adapt and the way to control students (Daly et. al., 2010). Formative assessments prioritise time (assessment during process not the end of learning) and its functions (to help improve rather than summarising) (Chen, et. al., 2013). In the broadest sense, it can be seen as an assessment practice that gives students the opportunity to adapt to their learning environment and to reduce the gap between students' understanding or achievement at recent level and the next level. Formative assessment is the process of providing feedback on the learning process so that teachers and students can directly adjust to the ongoing learning process to achieve better results in accordance with planned objectives (Black & William, 1998). This feedback provides intrinsic motivation for students to study harder (Ames & Archer 1988). Thus, formative assessment will become a "compass" to guide students towards better learning and academic achievement (Hwang & Chang, 2011). Academic pretensions here include students' high-level thinking skills (HOTS).

Formative assessment in the form of written tests is based on teaching material which is considered important, especially material that often appears in national exams. This sometimes facilitates a shift in the function of formative assessment . It is no longer to reflect and provide feedback, but rather to control knowledge where learning outcomes are factual knowledge and skills that can be right or wrong (Falchikov, 2005). Assessment which only accesses basic level knowledge (recalling factual knowledge) will only facilitate modest learning, but if the assessment emphasises application and understanding, it will make students learn more deeply (Weurlandera et. al., 2012). When students are actively involved in learning, teaching and assessment, they will learn how to think and practise certain materials (Anderson & Hounsell, 2007). Therefore, when students are actively involved in HOTS-based learning and high-level thinking, it must be accessed by assessment that is also oriented towards HOTS . In other words, learning that seeks to facilitate and awaken students' HOTS, should also be followed by an assessment that is able to access HOTS.

Some research findings indicate that formative assessment provides a positive impact on student learning outcomes (Weurlandera et. al., 2012). Once again, this learning outcome also concerns HOTS. In Indonesia, formative assessments are identical to daily tests, teachers

rarely use other forms of assessment, such as interviews, observation or self-evaluation. This daily test is still dominated by paper and pencil tests, in the form of objective tests and essay. Therefore, the teacher must change the assessment in the learning process from an algorithmic assessment such as "cooking dough" which predominantly measures LOTS to an open assessment that measures HOTS. Open questions expect students to be able to analyse and evaluate a problem including creating new or other work steps, which means that students have applied HOTS, and vice versa (Mahendra, et. al., 2019).

## Methodology

This study describes the extent to which a teacher's formative assessment accesses students' HOTS, so the approach used is descriptive . This study involves 27 Mathematics teachers in Bali who are distributed into 15 teachers of junior high school grade VII, VIII, IX and 12 teachers of senior high school grade X, XI, XII. Data was collected through documentation and interview methods. Documentation method is used when collecting formative assessments in the form of tests made by the teacher in the past year. Each test item made by the teacher is analysed and converted according to the cognitive level of the revised Bloom. HOTS is categorised from C4 to C6 while LOTS is categorized from C1 to C3. The determination of categories C1 through C6 is based on operational verbs (KKO) from Bloom (Anderson & Krathwohl, 2001; Morrison & Free, 2001; Lord & Baviskar, 2007) as presented in Table 1 below.

**Table 1:** Cognitive Levels and Examples of KKO from Bloom's Taxonomy revised by Anderson and Krathwohl

| **Cognitive Level** | **Cognitive process** | **Operational Verbs** | **Criteria** |
|---|---|---|---|
| Remembering (C1) | recognising, recalling | remembering, listing, repeating, imitating, knowing, mentioning, identifying | LOTS |
| Understanding (C2) | interpreting, exemplifying, classifying, summarising, inferring, comparing, explaining | explaining, clarifying, accepting, reporting, describing, distinguishing, repeating | |
| Applying (C3) | Executing, implementing | using, demonstrating, illustrating, operating, clarifying, checking, using | |
| Analysing (C4) | differentiating, organising, attributing | comparing, checking, critiquing, assessing, analysing categorising, differentiating | HOTS |
| Evaluating (C5) | checking, critiquing | evaluating, assessing, refuting, deciding, concluding, supporting, checking | |
| Creating (C6) | creating, planning, producing | constructing, designing, creating, developing, writing, arranging, formulating | |

After analysing the teacher-made test, the research step is continued through an interview session in accordance with the guidelines that have been previously made. This interview guide contains a number of questions relating to teachers' understanding of formative assessment as well as HOTS. This guide has calculated the validity of its content using the Lawshe's Content Validity Ratio (Lawshe 1975). The formulas used are:

$$CVR = \frac{n_e - N/2}{N/2}$$

**Information**

CVR = content validity ratio
$n_e$ = Number of panellists who gave a rating of 3 (important/relevant)
N = Number of panellists

Fifteen experts consisting of lecturers, teachers and education practitioners were told to give scores to interview guidelines. The assessment is divided into three categories: 1 = not relevant, 2 = less relevant and 3 = relevant. Of the 15 panellists, 13 said the interview guidelines were relevant and could be used as standard guidelines , 2 said they were less relevant and needed revision. Lack of relevance concerning sentences in the question must be asked from respondent. Based on the above provisions, the value of content validity is obtained as follows.

$$\text{CVR} = \frac{13 - 15/2}{15/2}$$

$$= \frac{13 - 7.5}{7.5}$$

$$= \frac{5.5}{7.5}$$

$$= 0.7333$$

The results of the analysis of content validity found that the VCR of 0.733 is higher than the minimum required by Lawshe which is equal to 0.620. The collected data in the form of quantitative and qualitative data was then presented descriptively in the form of graphs and tables.

**Results and Discussion**

The main focus of this research is the study of formative assessment conducted by the teacher. This formative assessment is in the form of daily tests used by the teacher . The collected teacher-made tests are analysed by the percentage of questions that are classified as HOTS as well as the percentage of questions that are classified as LOTS. HOTS focuses on applying knowledge to evaluate, analyse and create. In the context of assessment, questions that are classified as HOTS assess cognitive skills to analyse, evaluate, and create (Mohamed & Lebar, 2017). Questions that are used by teachers in formative assessment play an important role in increasing students' HOTS. The questions used questions must identify strengths and weaknesses in accordance with the learning objectives and stimulate students' HOTS (Mohamed & Lebar, 2017).

The teacher should be able to identify which are classified as HOTS and which as LOTS. The learning strategy must not be oriented towards triggering HOTS, but rather to measure HOTS. Therefore, there is a gap between the learning process and the assessment used. Furthermore, some teachers' learning process does not attempt to encourage HOTS , while

assessments are only used to measure LOTS . This study involves 41 Mathematics teachers in junior and senior high school levels. The interview results show that the teacher conducts formative assessments in the form of daily tests at least once at the end of each basic competency. There is also a statement after each subject is completed, if the subject is too dense, then daily tests can be completed two or three times.

According to the rules by Minister of Education and Culture of the Republic of Indonesia Number 37 of 2018, there are 3 core competencies (knowledge) that must be understood by junior high school students in Mathematics including understanding knowledge (factual, conceptual, and procedural) based on their curiosity about Science, Technology, Art, Culture related visible phenomena and events. For senior high school students it is to understand, apply, and analyse factual, conceptual, procedural knowledge based on their curiosity about Science, Technology, Art, Culture, and the Humanities with human, national, state, and civilisation insights related to the causes of phenomena and events, and applying knowledge of procedures in a specific field of study in accordance with their talents and interests to solve problems. The number of basic competencies for knowledge in Mathematics at each secondary level is presented in Table 2. below:

**Table 2:** Distribution of Number of Basic Competencies at Secondary School Level

| **Level** | **Class** | **Number of Basic Competencies** |
|---|---|---|
| Junior high school | VII | 12 |
| | VIII | 11 |
| | IX | 7 |
| Senior high school | X | 10 |
| | XI | 10 |
| | XII | 4 |
| **Total** | | **54** |

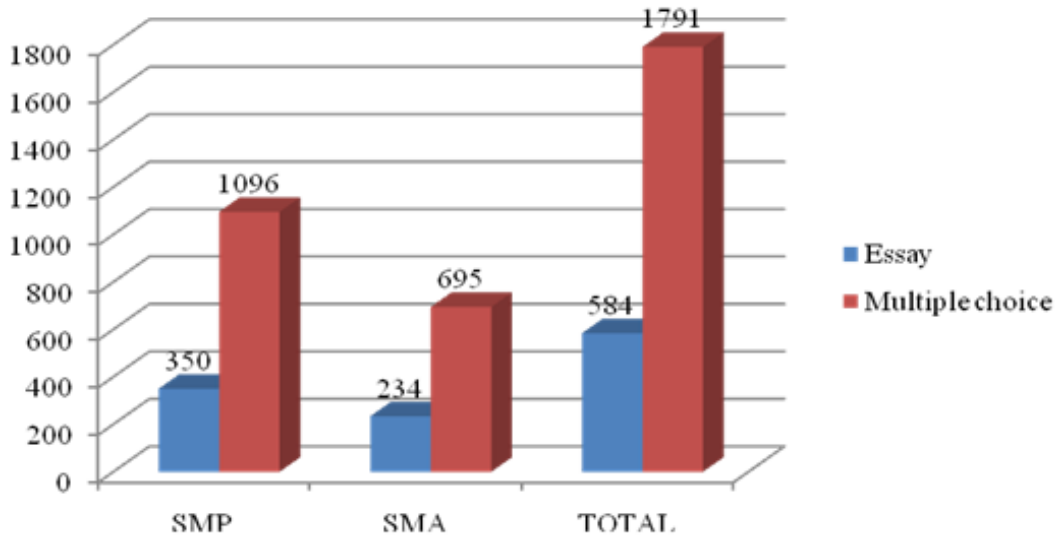
For seventh grade junior high school, Mathematics includes: a) integers with three basic competencies; b) sets, algebraic forms, equations and linear inequalities, angles, circles and basic statistics, each with one basic competency; c) comparison and social arithmetic with three basic competencies. For junior high school students in class VIII the study material includes: a) rows of numbers, Cartesian coordinates, Pythagorean theorem, tangents to circles, plane and solid shapes, basic statistics, and probabilities. For each basic competency; b) functions and linear equations each with two basic competencies. For junior high school students in class IX the study material includes: a) rank numbers and root, with four basic competencies, geometry transformation, congruence, area and volume of curved sides, with one basic competency. Therefore, in total there are 30 basic competencies for junior high school level . Meanwhile, grade X of senior high school includes: a) a system of linear equations, with four basic competencies; b) function, with two basic competencies; c)

trigonometry, with four basic competencies. For class XI senior high school, the learning material includes: a) mathematical induction, linear programming of two variables, number patterns, limits, and integrals, each with one basic competency; b) a matrix, with three basic competencies, c) a derivative, with two basic competencies. For senior high school class XII, the study material includes: a) distance in space, statistics, fractions, and probabilities, each with one basic competency. there are 24 basic competencies for senior high school . Thus, in total there are 54 basic competencies for secondary school level.

Referring to Table 2. and the explanation above, a teacher of grade VII junior high school conducts formative assessments a minimum of 12 times, for grade VIII a minimum of 11 times, and grade IX a minimum of 7 times. While at the senior high school level, for class X and XI at least 10 times, and class XII at least 7 times in two semesters or one academic year.

The first step taken is to analyse formative assessment in the form of collected questions. 246 formative assessments were collected in both the junior and senior high school levels through the documentation method. The collection of formative assessment is adjusted to the number of basic competencies available for each level of education, so that one basic competency is represented by one formative assessment. Of the 27 teachers involved, the number of items analysed is 2375 or an average of 88 items per teacher or 10 items per formative assessment. The questions are analysed one by one according to type, essay or multiple choice. The analysis results show that of 2375 items, 1791 items (75.41%) are objective tests in the form of multiple choice and the remaining 584 items (24.59%) are subjective tests in the form of essay tests. For junior high school level, 1096 items (46.15%) are multiple choice questions and 350 items (14.74%) essay questions, while for senior high school, 695 items (29.26%) are multiple choice questions and 234 items (9.85%) are essay questions. Figure 1 below provides clarification:

**Figure 1.** Portion of Items Number for Each Level of Education Seen from The Type of Question




It is evident that multiple choice questions are still popular amongst teachers as a cognitive measurement tool. As indicated in Figure 1., the portion of multiple choice questions is almost three times that of essay questions.

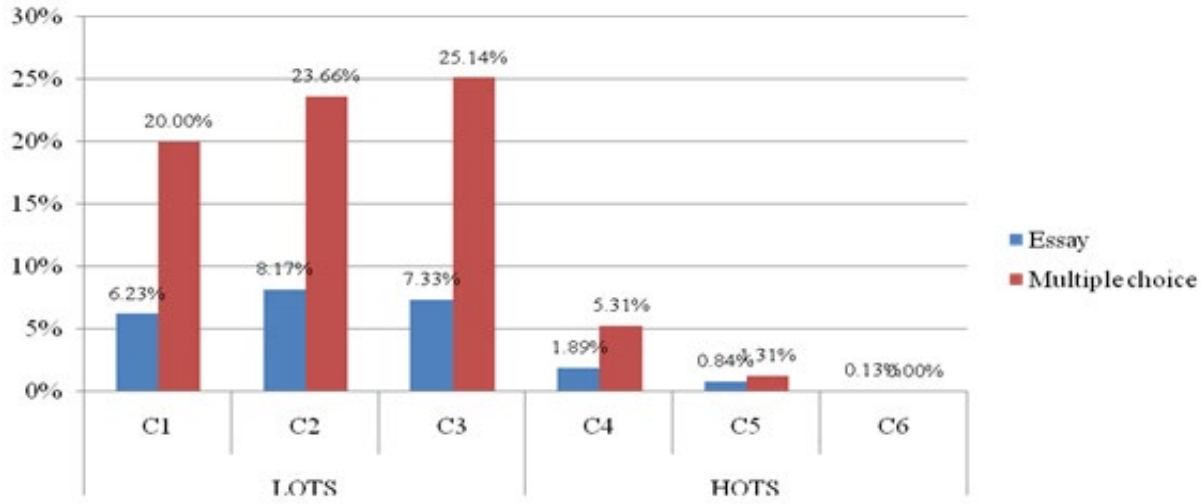
After becoming aware of the portion of questions based on type, the next step proceeds with an analysis of each item according to Bloom's cognitive level by using the verbs listed in Table 1. Categorising each item into cognitive level requires sufficient analytical skills. Therefore, analysis, the researcher asks for help from senior teachers who often receive HOTS arrangement training as well as colleagues who researched HOTS. The results of analysis for teacher made formative assessment are presented in Table 3. below:

**Table 3:** Percentage of HOTS and LOTS Teacher-Made Formative Assessment

| Cognitive Level | Essay | | Multiple choice | | Total | Percentage (%) |
|---|---|---|---|---|---|---|
| | Junior High School | Senior High School | Junior High School | Senior High School | | |
| Remembering (C1) | 124 | 24 | 385 | 90 | 623 | 26.23 |
| Understanding (C2) | 118 | 76 | 254 | 308 | 756 | 31.83 |
| Applying (C3) | 68 | 106 | 384 | 213 | 771 | 32.46 |
| Analysing (C4) | 27 | 18 | 68 | 58 | 171 | 7.20 |
| Evaluating (C5) | 11 | 9 | 5 | 26 | 51 | 2.15 |
| Creating (6) | 2 | 1 | - | - | 3 | 0.13 |
| **Total** | **350** | **234** | **1096** | **695** | **2375** | **1** |

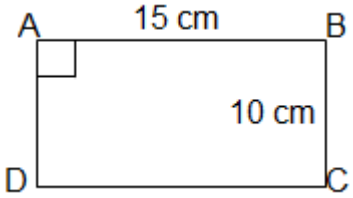
The results of analysis of teacher made formative assessment cumulatively shows 9.47% showing formative assessment measuring HOTS while the remaining 90.53% measures LOTS. The percentage of formative assessment in the form of HOTS questions is still lacking when viewed from the requirements of National Examination questions (UN) in Indonesia, which requires 10-15% HOTS or reasoning questions (BSNP, 2018) especially compared to the portion of HOTS questions in the Program for International Student Assessment (PISA), which is 25% (BSNP, 2018). Formative assessment that measures HOTS is dominated by questions classified as analysing (C4) totalling around 7.20%, there are still a few questions classified as evaluating (C5) of around 2.15% or creating (C6) around 0.13%. The percentage of formative assessment classified as HOTS and LOTS made by the teacher is depicted in Figure 2. Below:

**Figure 2.** Percentage of Formative Teacher-Made Assessments classified as HOTS and LOTS



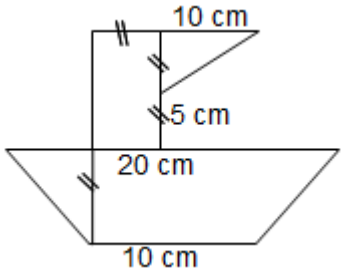

Examples of formative assessment made by teachers classified as HOTS at the cognitive level of creating (C6) are as follows.

*Essay questions for grade VII Junior High School about plane shapes material (level C6)*
*The size of plane shape ABCD is shown in the picture*




*Make another plane shape that has the same area as the ABCD plane shape.*

The above assessment can measure students' LOTS or HOTS. The question is classified as requiring an open solution. If students' answer is only limited to a plane shape such as square, parallelogram, circle, kite, or rhombus, it only measures cognitive levels at a low level, as drawing a plane shape when viewed from operational verbs is included in the level of understanding (C2). However, if the students' answers do not merely describe normal shapes, they learn something unusual (not routine), more complex, combining several plane shapes, then their answers have demonstrated HOTS at the level of creation (C6), that is designing or constructing. Creating is a process of producing new findings using previously known elements which involves the process of forming elements into coherent and functional entities (Anderson & Krathwohl, 2001).




According to the Malaysian Examination Syndicate (2013) HOTS questions measure cognitive skills for analysing, evaluating and creating. Furthermore, the characteristics of HOTS are said to be stimulating, non-repetitive, real-world situations, needing multilevel thinking and unusual contexts. Another example of a teachers' formative assessment classified as HOTS on the cognitive level of evaluating (C5) is presented below:
Multiple choice questions for high school class XII about rows and arithmetic progression material (level C5):

*If 18, a, b, c, d, e, f, g, -6 are arithmetic sequences, then it can be concluded that …….*

*A.* a + g = 10
*B.* a - g = 12
*C.* a - d + g = 16
*D.* *a - d + c* = 24
*E.* *a + d + g* = 24

The above questions include the cognitive level of evaluating (C5) because to answer these questions, students must be able to remember and understand factual, conceptual, and procedural material about arithmetic series and rows, linear equation systems and be able to use them in solving problems. They complete the analysis based on the equation obtained. This problem indicates several factors: 1) students use the concept of arithmetic rows and series to form linear equations, 2) students use their knowledge to calculate the middle value

of an arithmetic row, 3) students analyse the number of possible variable values, and 4) students are able to make decisions according to available choices.

The second step is the analysis of interview results to support the results regarding the first step. In conducting interview sessions, researchers are assisted by VII semester students of the Mathematics Education Study Program of IKIP PGRI Bali. Previously, they had been gathered to equalise perceptions about the questions to be asked from the teacher in accordance with interview guides. There are 7 questions involved in this study. In essence, the questions are related to two aspects, the teachers' understanding of the function of formative assessment and HOTS questions. The following is an example of the results of an in-depth interview with a junior high school Mathematics teacher in Denpasar, with the initials IKMAP.

Researcher : "Have you ever heard about formative assessment?"
Interviewees : "Yes, I have," but I don't understand its meaning."
Researcher : "What did you do to achieve learning success?"
Interviewees : "First," to assess my students' learning skills in understanding the given material, I provide a daily test after 1 basic competency with an average meeting of more than 4-5 meetings, but if the content in one basic competency is too many, I will provide 2 daily tests. At a minimum, I provide one daily test when I finish one basic competency. Second, at each meeting I always pay attention to student learning activities, I usually put the sign (✓) on the name of the active student, in assessing students' effort.
Researcher : "What is the results of daily tests used for?"
Interviewees : "To measure whether students already understand the material that I've presented . If it meets the minimum completeness criteria, it means that the learning has succeeded, but if that's not the case, , I can make changes to the learning strategy, for example, clarify teaching materials or provide more practice questions."
Researcher : Is your formative assessment in the form of daily tests, essays or multiple choice questions?
Interviewees : Multiple choice questions.
Researcher : "Why do you choose that type of question"?
Interviewees : "Because it's easier to compile, and can contain all indicators. It's easy to check as there are a lot of students."
Researcher : "Have you ever heard of HOTS questions?"
Interviewees : Yes, and I have been involved in relevant training, HOTS stands for Higher Order Thinking. HOTS questions consist of queries that have been measured from C4, C5, and C6, while LOTS is measured from C1, C2, and C3. Meanwhile, the school K13 curriculum is expected to refer to HOTS

questions. In terms of learning, HOTS involves 3 aspects of high-level skill, : transfer of knowledge, critical thinking and creative problem solving. However, it needs to be understood that sometimes we have difficulty in constructing HOTS questions, perhaps because it is new for us.

Researcher : "Did you consider HOTS and LOTS when you constructing questions for daily tests?"

Interviewees : "They must be considered as a percentage. For example, if the questions consist of five items, three of them are LOTS questions and the rest are HOTS or about 20% are HOTS questions. If all questions are in the HOTS , it will be difficult for students to answer them because they require higher reasoning abilities."

Researcher : "What do you wish for future understanding of HOTS and LOTS?"

Interviewees : I hope the Government will provide more frequent relevant training or workshops to teachers , because there are still many teachers who do not understand HOTS and LOTS. There are some teachers who don't understand them at all.

One of the interview result clearly shows teachers' understanding of formative assessment and HOTS questions. Almost all teachers gave the same response, at first they were confused by the concept of formative assessment, but they understood daily tests. The purpose of providing daily tests is to measure the success of students in understanding the material being studied. Formative assessment is defined as a way for teachers to recognise and respond to the learning process that aims to improve the process itself (Cowie & Bell, 1999). The purpose of formative assessment is to provide feedback to the learning process carried out by the teacher. This assessment is conducted while the learning program is still ongoing. Therefore, if deviations occur or are incompatible with learning objectives, the teacher can make quick improvements. Formative assessment conducted by teachers is dominated by written tests in the form of multiple choice. As supporting material for conducting feedback, some teachers conduct assessment of students' effort in class even though they only provide a mark without clear guidelines which refers to active, half active or inactive. The provision of daily tests at the end of each basic competency is used for input for teachers to reflect on the learning process in the form of formative assessment that has been pre-planned by the teacher . This planned formative assessment is characterised by special activities undertaken by both students and teachers. Whereas, giving marks to students who are active in class is done spontaneously by the teacher, so it is categorised as an unplanned formative assessment. In terms of the process of implementation, according to Cowie & Bell (1999) there are two types of formative assessment, including the unplanned interactive formative assessment process . The application of two types of assessment can be combined to attain maximum results, as they support and complement each other.

Meanwhile, by examining the interview results concerning HOTS, some teachers have understood what it's is about. In fact, several training sessions are offered by HOTS, but there remain some teachers who only know what HOTS stands for but do not understand the concept itself. Judging by the questions , for teachers who have already attended training there are indeed types of HOTS questions but the percentage is few . Interview results also indicate that the teachers still have difficulty in compiling HOTS questions, as they are not confident about whether the questions are classified as HOTS or LOTS. This is in accordance with Schulz & Patrick's view (2016) who maintain that teachers do not yet understand the HOTS concept very well so they are not ready to prepare HOTS assessments. Previous research also shows a lack of teachers' ability in compiling HOTS questions. There are even secondary school teachers who are not familiar with the term HOTS (Apino & Retnawati, 2017). Of course, teachers' ability to arrange HOTS questions needs to be improved in order to obtain better student learning outcomes.

The selection of daily test questions is still dominated by multiple choice questions, completed by the teacher as they are easily arranged and examined. Morrison & Free (2001) maintain that multiple choice questions are still the main choice for teachers because they are easily arranged and easy to examine if there are a large number of students. Several strategies can be used to arrange multiple choice questions to access students' HOTS (Scully, 2017)including: 1) manipulating specific verbs that are associated with several cognitive processes. This method must be undertaken carefully because one verb can measure various cognitive levels. For example: "choosing" can include C1 but if the vote is preceded by conducting an analysis then it can be in the C4 category. 2) Inverted items, questions that present comprehensive concepts or categories and students are expected to recognise specific examples of the concepts presented . 3) Using high quality deception, the false answer must not be similar to the key answer, it must contain a high level of discrimination so that the distinction between the true and false answer is not obvious . As a result, students will not be able to guess which answers are correct. 4) Taping on a lot of nerve cells means that the question is not able to be answered by students by using only one nerve cell (in a figurative sense), which is a one-shot question in the form of memorisation once correctly answered . The questions must be able to generate various nerve cells .

## Conclusion

This study is classified as a quantitative descriptive study which attempts to analyse the percentage of HOTS questions contained in teachers' formative assessment in the past year by involving 27 Mathematics teachers in Bali. The cumulative results obtained show that 9.47% of teachers' formative assessment questions are categorised as questions that measure HOTS and the remaining 90.53% are classified as LOTS questions. Teachers' HOTS questions are dominated by cognitive level of analysing (C4) both for essay and objective

tests, which are 1.89% and 5.31%, respectively. When compared to National Examination (UN) questions, HOTS formative assessment made by the teacher has not yet fulfilled the criteria which ranges between 10-15%, even it is less compared to the portion of HOTS questions in PISA which requires 20%. The hope of teachers, especially in Mathematics , is that the Government, in this case, the Ministry of Education and Culture will be more assertive in providing training or workshops regarding the preparation of HOTS questions. Therefore, teachers' ability to compile HOTS questions, both in formative and summative assessments is increasing.

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