Needs Analysis of Development Higher Order Thinking Skills-based E-module for Students High School

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Abstract. Higher-order thinking is one of the skills that must be possessed by students in learning in the era of the industrial revolution 4.0. The use of teaching materials that do not facilitate students to develop higher order thinking skills has an impact on the achievement of learning objectives. This study aims to develop an e-module based on Higher Order Thinking Skills (HOTS) for high school students. The e-module was developed using a research and development design with reference to the development of the ADDIE model. Data collection techniques in this study used interviews, observations, instruments and response questionnaires. The data obtained were then processed using descriptive statistical analysis. The implementation of e-modules as a learning resource for students can be used as independent learning, both at school, at home, and wherever they are without being tied to time. The results of this study indicate that the use of HOTS-based e-modules in learning can improve students' higher order thinking skills, and can make students learn independently.

Keywords: Teaching materials, E-modules, HOTS

INTRODUCTION

The education system in Indonesian currently uses the 2013 curriculum, which encourages students to be more active in the learning process. In the 2013 curriculum, the learning process develops the potential possessed by students from various aspects, namely: 1) attitude (affective), 2) knowledge (cognitive), and 3) skills (psychomotor). In learning the 2013 curriculum, it also requires students to have higher order thinking skills (HOTS) (Noviani, 2020). This is in accordance with the purpose of education which leads to training students to think critically, creatively, and analytically in the learning process. Critical thinking skills can be classified into 2 parts, namely higher order skills thinking and lower thinking order skills (Hanifah, 2019). HOTS is a higher order thinking ability that demands critical, creative, and analytical thinking (Fanani, 2018).

According to 2015 PISA data, it shows that Indonesian students are low in mastery of the material and have difficulty answering questions that require reasoning. In line with that, the 2017 National Examination results show that students are still weak in HOTS such as reasoning, analyzing, and evaluating (Warisdiono, 2017). Though, HOTS is one of the abilities that must be possessed by students through the learning process. E-module is one of the teaching materials in the learning process that can increase HOTS through the presentation of questions that stimulate students' higher thinking processes (Anisah & Sri, 2018). Various studies have shown that learning using electronic learning materials can improve students' ability in higher-order thinking (Anggriani, 2019). Based on the description above, the developed e-module was HOTS-oriented.

This research is supported by research on the development of HOTS-based learning in schools showing that the development of learning tools that include lesson plans, teaching materials, LKPD, learning media, and learning assessments designed by taking into account the principles of HOTS are able to produce complete learning outcomes (Fanani, 2018). This is used as a reference for researchers to conduct a needs analysis as a basis for "Development of E-modules Based on Higher Order Thinking Skills (HOTS) for high school students".

RESEARCH METHOD

Research Procedure

Type of research used is research and development and (R and D), which refers to the development model ADDIE which consists of five stages: analysis (analysis), design (design), Development (development), implementation (implementation), and evaluation (evaluation), including the development of modules e-based Higher Order Thinking Skills (HOTS). Research is limited to the initial analysis stage. The analysis phase (analysis) includes needs assessment (needs analysis). Needs analysis is an activity to collect information about the gaps that each student should have with what they already have. This needs analysis will result in the identification of student characteristics, identification of student gaps and the requirements or specifications of the product to be developed.

First, the researcher analyzed the needs of students and teachers through interviews and direct observations made to students of class XII high school. Data

collection instruments were using observation sheets and questionnaires. Then the researcher determines the aspects of HOTS to be measured, based on the results of a literature study to determine the standard aspects used to measure HOTS. Then it is generated; 1) Aspects of the revised Bloom's Taxonomy are most commonly used in measuring HOTS, 2) Determine the main aspects of the revised Bloom's Taxonomy by adjusting to the 2013 Curriculum applicable in Indonesia. Thus, aspects of the revised Bloom's Taxonomy that researchers use as the main aspects in measuring students' HOTS are analyzing (C4) and evaluating (C5). These aspects have also been adjusted to the competencies in the 2013 Curriculum. The following table shows the aspects and sub-aspects of HOTS which are measured based on the selected aspects.

Table 1. HOTS Aspects and Sub-Aspects HOTS

HOTS Aspects	Sub-Aspects HOTS
Analyzing (C4)	Identifying
	Distinguishing
	Distinguishing characteristics
	Finding
Evaluating (C5)	Sorting
	Compare
	Assessing
	Selecting
	Predicting
	Determine

Adapted from Eveline (2021)

Data Analysis

Researchers analyzed the research data using descriptive analysis techniques. The analysis includes, 1) determining the frequency and percentage of students' HOTS, and 2) determining the average score of each measured HOTS aspect. In addition, researchers also analyzed the results of data collection instruments using observation sheets and questionnaires. Observation sheets were used to obtain data on learning activities by teachers in schools, as well as school capacity in implementing *e-learning*. Questionnaires are used to obtain data about learning resources that have been used by students, as well as the needs of teaching materials desired by students.

RESULTS AND DISCUSSION

Based on interviews and direct observations conducted to students of class XII high school, the results obtained: a) students are very enthusiastic about technology and the use of interactive media, b) students often use laptops and smartphones in learning activities both in class and outside the classroom (online learning). The results of interviews and direct observations of teachers found several problems faced by teachers including those related to student learning resources, namely: 1) teaching materials in schools are not in accordance with the

development of students, and have deficiencies both in terms of material content, examples material, and evaluation questions that are not relevant to the daily lives of students. This results in limited references in learning, 2) teachers have difficulty in determining learning strategies in order to achieve the expected learning objectives, this makes it difficult for students to understand the material presented by the teacher and 3) teachers have difficulty processing learning to be effective in a fairly long time quite short. The results of interviews with teachers can be seen in Table 2 as follows.

Table 2. Teacher Interview Results

No.	Questions	Teacher 1	Teacher 2
1	What teaching materials do you use in learning	Textbooks and the internet	Textbooks, PPT and the internet
2	Are there any shortcomings in the teaching materials you use?	Not complete, and difficult to understand by students	Examples are not clear, not in accordance with the daily lives of students, material is lacking
3	Have you ever used modules in learning? If so, what kind of module? If not, what kind of module do you expect?	Once, namely modules that are usually purchased, and examples of colorless/black-and-white images. Hope the modules are in color, the language is easy to understand, and efficient to use	Not yet, hopefully the modules are easy to understand, complete in terms of material and examples that are relevant to the lives of students
4	What is the use of electronics module (E-module) good at school?	Yes, it is very efficient to use, overcomes the limitations of time and place	Yes, it is easy to use, with little cost, and the school also has internet network access.

The problems found by researchers based on interviews and direct observations of teachers related to the application of HOTS in learning are: a) learning has not been based on thinking skills, especially higher order thinking (HOTS), b) practice questions as a form of assignment have not been based on HOTS, c) no teacher has ever developed HOTS-oriented teaching materials.

In this study, the first analysis was to determine the frequency and percentage of students' HOTS by category. The percentage of HOTS for class XII students for the very good, good, sufficient and less categories are 0%, 13.5%, 31%, and 55.5%,

respectively. The largest percentage is in the less category so that it can be said that the majority of HOTS of high school students in class XII are in the less or low category. Eveline (2021) found similar results where the highest percentage of high school students' HOTS (69.5%) in Pontianak City, West Kalimantan was in the low category. The results of the analysis can be seen in Figure 1.
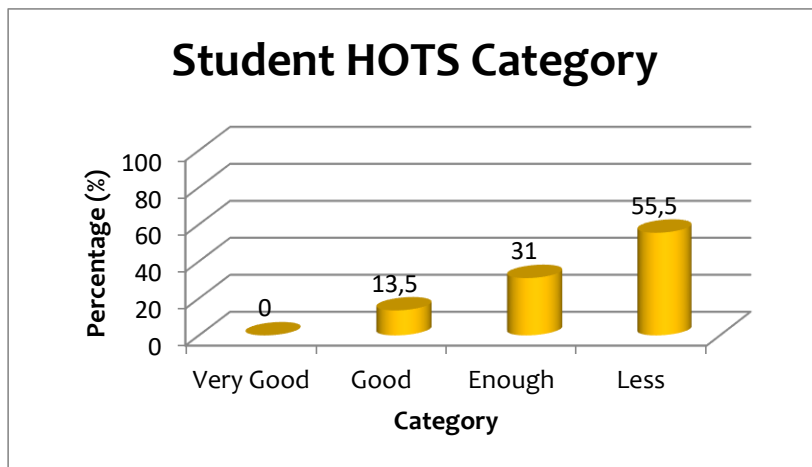

Figure 1. Student HOTS Category in Percentage

The second analysis is to determine the average student score for each HOTS aspect. The results of the analysis can be seen in Figure 2.
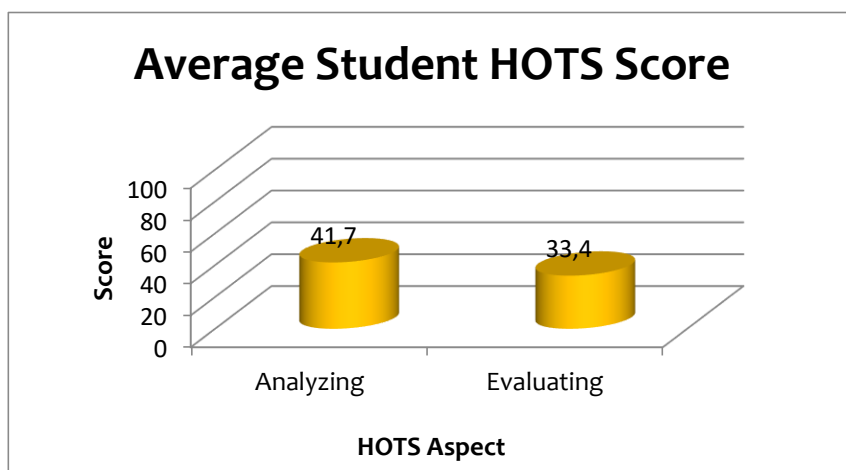

Figure 2. Average Student HOTS Score on the HOTS Aspect

Based on Figure 2, the average score for analyzing (C4) is 41.7 and evaluating (C5) is 33.4. These scores fall into the sufficient category. The scores for both aspects of HOTS can be said to be low so that it still needs to be improved. Even though they have understood the subject matter well, students often experience errors in understanding questions from high-level questions (HOTS). This is what makes students fail in determining problem solving strategies (Abdullah, 2015). Another factor that causes students' HOTS to be low is that students have not been trained to think high-level in classroom learning.

Based on these data, it can be concluded that the current low quality of education is related to the very lack of efforts to empower students' thinking abilities during the learning process. Conklin & Manfro (2012) stated that there are two characteristics that underlie higher order thinking skills, namely critical and creative thinking. This is in line with the opinion of Brookhart, et al (2010) HOTS is included in critical thinking, while according to Hanifa (2019) HOTS includes creative thinking skills.

This is reinforced by Corebima (2016) which states that the necessities of life in the 21st century include thinking skills, including metacognitive skills which are classified as thinking skills, namely critical thinking skills and creative thinking skills. Likewise, creative and critical thinking skills are included in higher order thinking skills. (Brookhart, 2010). HOT aims to foster critical, logical, reflective, metacognitive, creative thinking and improve thinking skills at a higher level (King & Goodsong, 2011; Barnett & Francis, 2016). In line with that, Trilling & Fadel (2009) stated that there are 3 21st century skills, one of which is learning and innovation skills learning and innovation skills including: a) critical thinking and problem solving (Critical Thinking and Problem Solving), b) communication and collaboration (Communication).), c) creativity and innovation (Creativity and Innovation).

In the era of 21st century knowledge, high quality human resources are needed who have skills such as being able to work with others, think critically, creatively, skilled, understand various cultures, communication skills, computer skills, and self-regulated learning. (Trilling & Hood, 1999). Entering the 21st century, the learning paradigm changes towards *student centered* and students need to be equipped with high-level thinking skills or HOTS (Zohar, 2004). Based on this, we need a teaching material based on higher order thinking skills that can help teachers to improve students' higher-order thinking skills and increase the enthusiasm of students in learning.

The teaching materials developed by the researchers are e-modules. Various studies have shown that learning using electronic learning materials can improve students' ability in higher-order thinking (Anggriani, 2019). The content of e-module the developed contains questions that specifically train students' higher-order thinking skills. According to Anisah & Sri (2018), e-module is one of the teaching materials in the learning process that can improve HOTS through the presentation of questions that stimulate students' higher thinking processes. The preparation of materials and questions based on relevant references so that the contents of the materials and questions on the e-module are correct and in accordance with the 2013 curriculum standards with the questions on the e-module designed based on the HOTS domain at taxonomic levels C4 and C5, namely the ability to analyze and evaluate.

The development of a teaching material in the form of-e-module a HOTS based that helps improve students' higher-order thinking skills in understanding concepts and increases students' learning motivation. -e-module This HOTSbasedis expected to help teachers improve the ability of students to think at a higher level and add independent teaching resources for students to overcome the limitations of time and place because it is in the form of electronic print media. According to

Hill (2015), thisactivity e-module is one of the teaching materials that requires students' independence to find a concept. According to Pratama's research (2018), learning using e-modules can encourage students to better understand the material and create fun learning for students. Through the use of e-modules, teachers can link learning, so that learning becomes more meaningful, fun and easy to understand.

CONCLUSION

Based on the results of the study, the HOTS of students was in the poor category. When viewed from every aspect of the measured HOTS, the skills to analyze and evaluate are in the sufficient category. Thus, it can be said that the HOTS of class XII high school students is still low. This finding proves that learning that aims to develop students' HOTS needs to be done. In learning, HOTS-based teaching materials are needed. Utilization of teaching materials in the form of e-modules can increase students' learning motivation and improve students' higher-order thinking skills and help students learn independently. Learning that aims to develop students' HOTS needs to be done. Teachers can practice analyzing and evaluating students' skills in each learning process by integrating appropriate teaching strategies assisted by the use of teaching materials e-module HOTS based in their learning.

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