Jurnal Pendidikan Biologi 11 (2) (2022) 62 - 69
Jurnal Pendidikan Biologi
Journal of Biology Education
http://jurnal.unimed.ac.id/2012/index.php/JPB
eISSN: 2502-3810 pISSN: 2086-2245

Analysis of Online-Based Higher Order Thinking Skills in 21st Century Learning During the Covid-19 Pandemic

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INFO ARTIKEL

Histori Artikel
Received 13-10-2021
Revised 20-04-2022
Accepted 13-06-2022
Published 01-09-2022

Keywords:
Analysis, HOTS, Online, Pandemic, 21st century learning

ABSTRACT

This research is an attempt to obtain information about the quality of the types of HOTS questions in Makassar City High School and provide solutions as reference material in determining the next Biology Questions that will be made. This research was conducted descriptively where data was collected to study the types of HOTS questions and obtain information about them. The following methods were used to obtain data for this study: (1). Problem solving, researchers, lecturers, and teachers analyzed each question based on the three characteristics contained in each item: 2) indicators consisting of stimulus, critical thinking skills, and problem solving abilities, 3) conducting Focus Group Discussions to see if each belong to the item in question. Count the data for each question number analysis finding. The analysis findings were then tabulated for each indication. Almost all of the HOTS questions (84%) and the "almost all" feature (94.2%) were found to be in accordance with the specifications of the competency achievement indicators in this study. All HOTS type questions have a stimulus on the stimulus indicator. Pictures stimulate "half" of the HOTS questions, case fragments stimulate "less than half", and diagrams, tables, and examples stimulate only a small number. In terms of critical thinking indicators, 91.86 percent of the HOTS questions in the "almost all" category have critical thinking characteristics, while "a small part" (26.23 percent) HOTS questions are problem solving, such as problem solving questions with identifying indicators. Troubleshooting identifies non-conforming issues, and solves problems based on data.

How to Cite
Nurhidayah, N., Yunus, M., Prasetyo, M. M., Rusdianto. (2022). Analysis of Online-Based Higher Order Thinking Skills in 21st Century Learning During the Covid-19 Pandemic. *Jurnal Pendidikan Biologi,* 11(2), 62-69.

INTRODUCTION

Quality learning should be formed in every element of education based on the criteria of active, innovative, creative, effective and fun learning. The current learning method applies a curriculum with a scientific approach that is adapted to the demands of 21st century learning (Al Kandari & Al Qattan, 2020; Bernhardt, 2015). Therefore, it is the duty of every teacher to maximize their efforts in

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DOI: http://dx.doi.org/10.24114/jpb.v11i2.28540

presenting a form of learning that is not only fun but also has a critical and innovative impact on students (Asari et al., 2021; Burhanuddin, 2017; Wakhidah, 2018).

The assessment rubric is a tool in the form of an assessment that is used by teachers to measure and evaluate students' abilities, to obtain this assessment one of them can be obtained from learning outcomes tests. As stated by Hamidah & Yanuarmawan (2018); Susiaty & Oktaviana (2019) that the contribution of the assessment must provide comprehensive information so as to help teachers to improve their teaching skills and for students to achieve optimal pedagogic development. Such as the Higher Order Thinking Skill (HOTS) assessment which requires various techniques and assessment tools. The tools or instruments used for the HOTS assessment were chosen to meet the needs of students' higher order thinking skills. Students must be trained in thinking skills problems by asking them questions with the HOTS category that can be used to improve students' thinking skills.

According to Kunandar (2015), teachers in evaluating the cognitive domain (knowledge competence) can be done in three ways, namely: a. Written test with questions, b. Oral test by asking students directly using a list of questions, and c. Assignments in the form of projects use certain worksheets which students must complete within a set time limit. Written test with details of items such as: a) multiple choice questions, b) papers, c) short answers (short), d) true and false (B-S), e) correspondence, and f) descriptions. In general, multiple choice and essay tests are widely used in high school graduation exams. On this basis, the discussion of multiple-choice test kits is appropriate. Therefore, a discussion of multiple choice tests is needed to properly describe its characteristics.

Arikunto (2002), finding or knowing students' weaknesses, needs to use diagnostic tests in learning activities. Susiaty & Oktaviana (2019) states that the learning outcome test is a test used to evaluate the results of lessons that have been given by teachers to students. The tests given by the teacher can be in the form of subjective tests and objective tests. The test is said to be classified as objective because the evaluation process is carried out objectively, meaning that anyone who corrects the test answers will get the same results because the answer key is clearly unambiguous (Oktaviani, 2017). This form of question is used to determine the level of student mastery in the cognitive domains that are memory (memory), understanding, application, analysis, synthesis, and assessment.

The final semester exam questions that are made should require students to think critically (Wakhidah, 2018). This is in accordance with the implementation of the 2013 Curriculum which should produce creative, productive, innovative and affective human resources, through strengthening aptitude, knowledge and skills competencies (Subagia & Wiratma, 2016).

The Ministry of Education and Culture's policies during the Covid-19 pandemic should not only be related to semester exams, the evaluation tools used should also be able to assess higher thinking skills (HOTS) to test the process of synthesis, analysis, evaluation and forms of creativity (Kemdikbud, 2020). During the current pandemic, every teacher should be able to train students to develop their thinking skills (Sartika & Munastiwi, (2019); Zein, (2016). By presenting HOTS questions that can be used to improve students' thinking skills. Types of questions such as This is proposed by applying basic skills that can be used to measure students' general thinking abilities.

The difficulty of teachers in determining the quality of the questions that have been made is because they do not know whether the questions made are of the HOTS or LOTS type (Arti & Hariyatmi, 2015; Hariyatmi & Luthfia, 2020). The reason is because teachers still have difficulty determining the type of questions that have been made so far. During the current online learning, the questions made by biology teachers are taken from the internet or articles on google without regard to the quality of the questions. If this is allowed, the provision of HOTS questions is still limited so that it reduces the habits of students to solve HOTS questions. From what has been described previously, the next step that will be taken by the researcher is to conduct an analysis of HOTS questions based on the explanation described above for online-based high school Biology exam questions during the Covid-19 outbreak. The purpose of this research is to find out what the quality of the questions on Biology at SMA Makassar City is like and whether the questions are included in the HOTS or LOTS derivative types.

Researchers hope that this research can provide solutions and benefits to biology teachers in Makassar City as a reference material in determining biology questions that will be made next and can identify how the quality of the questions that have been made so far. This research can also be used as a benchmark for local governments to determine the ability of teachers in the field of biology in making assessments in the form of HOTS type questions and also assist government programs in preparing programs to improve learning competencies oriented to higher-order thinking skills.

METHOD

Types of research

This research is classified as descriptive research through the process of collecting data to describe the situation or obtain information about the types of questions.

Research Sample

The sample in this study was the 2020/2021 High School Biology Final Semester Exam which was made by the teacher as preparation for UAS which followed health protocols in the covid-19.

Data Collection Techniques

The data used were collected using a prepared questionnaire. The questionnaire used in this study is a question quality evaluation questionnaire in the form of a list with the number 0 (zero) if it is not appropriate and the number 1 (one) if it is appropriate.

Data analysis

Furthermore, the data analysis technique applied in this research is descriptive analysis which is content or document analysis, while the mechanism of the analysis is as follows: 1). Grouping the items for the Biology School Semester Final Exam at the high school level which are included in the HOTS category, 2). The data obtained from the subsequent questionnaires through the FGD process were then tabulated into tables, and 3). The data were recapitulated by calculating the percentage and characteristics of the HOTS type questions, namely stimulus, critical thinking skills and problem solving skills using a formula.

After obtaining the results of the analysis of each characteristic of both the stimulus, critical thinking skills and problem solving skills then presented in the form of a percentage table. After obtaining the percentage of each characteristic, the percentage of each of the question analysis officers is added up and divided by the number of question analysis officers. The final

percentage result is interpreted into the following criteria:

Table 1. Conformity Criteria

Scale	Conformity Criteria
0 – 20 %	Fraction
21 – 40 %	Less than half
41 – 60 %	Half
61 – 80 %	Most of the
81 – 100 %	Almost all

RESULTS AND DISCUSSION

The results obtained from the analysis of national standard school exam questions (USBN) with a total of 50 questions are as follows: there are 42 questions belonging to the HOTS type, so that only 42 items can be analyzed. The criteria for these questions can be seen in the following table:

Table 2. Quality of the 2020/2021 High School Biology School Exam Questions (N=50)

Question Type	(%)	Criteria
HOTS	84	Almost all
LOTS	16	Fraction

Information data seen from Table 2, it appears that the criteria for "almost all" of the questions are of the HOTS type and the criteria for "a few" are of the LOTS type. This is based on the basic competency requirements that require more KD HOTS at the high school level than LOTS type questions, in order to meet the achievement of graduate proficiency standards of content standards and the applicable curriculum.

Looking at the research data in Table 2, the criteria for the 84% question "almost all" are of the HOTS type. The importance of HOTS knowledge in solving problems is to develop creativity, think critically, make decisions and solve problems in tracing the 21st century and the era of the industrial revolution 4.0. Therefore, it is necessary to ask HOTS category questions to high school students, because higher education level comes with higher demands. According to Sani (2019), Students must be able to reason, consider, analyze, evaluate and make decisions in order to be classified as capable of critical thinking. Fanani (2018) added that The characteristics of higher order thinking skills are: 1) prioritizing higher order thinking skills and minimizing aspects of knowledge or memory, 2) relying on contextual problems, 3) interesting stimuli and 4) ease of higher order thinking characteristics including the ability to find new methods, analyze , develop, reflect, predict, reason and make the right decisions (Subadar, 2017).

In addition to the HOTS question levels, competency achievement metrics and question characteristics were also used to analyze the relevance of the questions. Below is a table of data on the results of the correspondence between questions and indicators of competency mastery.

Table 3. The suitability of the items with the indicators of competency achievement (n=42)

Suitability	(%)	Criteria
In accordance	94,2	Hampir Semua
It is not in accordance with	5,8	Fraction

Table 3 presents the results of the study which explains that there is a match between the indicators of competency achievement on the item questions with the criteria of "almost all". This proves that the grid made must be appropriate for each question item in order to achieve the indicator of competency achievement. Results of research by Ruhimat (2018) also said that there is potential for inconsistency if the criteria for the questions are based on a grid with indicators of competency achievement. As a result, the tool used as a benchmark for evaluation of the assessment becomes disproportionate. Apart

from observing the conformity indicators, the characteristics of the school Biology exam questions were also observed, and below is a tabulation of the characteristics of the type of stimulus on the school exam questions.

Table 4. Characteristics of the type of stimulus (n=42s)

Stimulus form	%	Category
Picture	40,10	Half
Diagram	11,30	Fraction
Table	10,30	Fraction
Example	15,20	Fraction
Case fragment	23,10	Less than half
Amount	100	Almost all

The number of percentages listed in table 4 can be seen from all HOTS type questions that contain a stimulus. It can be seen that the "small part" category has diagrams, tables, and examples as stimuli. Furthermore, the "half" category of HOTS questions has an image stimulus, while the case fragment stimulus is in the "less than half" category. In line with Lailly & Wisudawati (2015), To instill superior thinking skills, each item with a stimulus should be given as a basic question. The ability to synthesize, analyze, and evaluate is part of the Higher Order Thinking Skill through encouragement or stimuli such as pictures, experiments or incident phenomena that must be solved.

Then those belonging to the "half" category for image stimulated questions are also shown from the research results in table 4. According to Suswina (2016), Biology concepts without the help of pictures are less able to present a good understanding for those who read them, because the source of explanation and understanding of the structure and process comes from pictures. (Arsyad, 2004) stated that teachers and students have been ignoring the image display, so that Biology learning material is underestimated. The auditory and visual experience gained from information is a form of significance in communication. As stated by (Zhang *et al.*, 2019), Learning experiences can be obtained from 75% based on visual, 13% based on hearing, and the remaining 12% based on other sensory abilities.

After the stimulus pattern, the characteristics of the problem-solving form and critical thinking patterns were also observed as follows:

Table 5. Characteristics of critical thinking (n=42)

Indicator	%	Category
Focus on the question	44,24	Less than half
Analyze arguments	5,40	Fraction
Determining the conclusion	18,91	Fraction
Define concept	4,40	Fraction
describe	18,91	Fraction
Amount %	91,86	Almost all

The results of the research in Table 5 show that in the "less than half" category, examples of questions in the critical thinking category are those that have indicators focusing on questions. Furthermore, the questions on indicators analyze arguments, determine conclusions, define concepts, and describe in the "small part" category. This finding can explain that critical thinking questions are often found in school exam questions. Widana (2017) mentions that critical thinking in the form of skills is very important for students' needs to have broad insight, be creative and imaginative. Therefore, it is very important to train these skills from an early age to students in the 21st century, where competition is becoming tougher.

The data display in Table 5 shows the results of the study, namely that the percentage of "almost all" of the HOTS questions is characterized by critical thinking. This indicates that critical thinking questions are needed for the development of students. The results of this study are in line with Setiawan *et*

al., (2018) which states that students have the ability to think since birth. The more often people are exposed to something that prompts them to think, the more they will develop and the higher their thinking abilities.

Even the thinking ability of individuals who do not receive special education will increase if they are often faced with various problems. Meanwhile, Qurniati *et al.*, (2015) revealed that critical thinking as a form of skill must be developed from an early age. Critical thinking skills here are needed to train students' abilities through the assumption that naturally these abilities are not fully owned by students - critical thinking can be trained by asking habituation questions, including practice questions with critical thinking indicators.

The research results listed in Table 5 show that the "almost all" category HOTS questions (91.86%) contain the characteristics of critical thinking. These results indicate the need for critical thinking practices. According to Zubaedi (2011), The nature of one's critical thinking can be improved through continuous practice so that it eventually becomes a habit. Critical thinking can lead to the formation of wise traits and allows a person to analyze information carefully and make the right decisions when facing global problems. Analysis involves the ability to break down information components into their constituent parts and determine the relationship between these parts and the overall information in general (Anderson, L.W. Krathwohl, 2010; Syahri & Ahyana, 2021). The ability to analyze is part of higher order thinking skills (Nawawi, 2016). This ability is part of critical thinking skills (Facione, 2015) and indispensable in 21st century life (Redecker & Punie, 2011).

In this study, in addition to the characteristics of critical thinking, the characteristics of problem solving abilities were also observed. The data found are listed in Table 6.

Table 6. Characteristics of problem solving skills (n=42)

Indicator	%	Category
Identify the problem	8,12	Fraction
Identify non-conforming issues	3,60	Fraction
Troubleshooting based on data	13,51	Fraction
Amount	26,23	Fraction

In Table 6 the accumulated percentage of 26.23%, which means that the results of this study are in the "small part" category of HOTS questions with problem solving characteristics, including problem solving problems with indicators identifying irrelevant problems and problem solving based on facts. From the characteristics of problem solving skills that have been identified, although the task is only a small part, this case shows the need to introduce students to problem solving strategies. In line with Idris *et al., (2018)* students must have problem-solving skills to familiarize themselves with different problems, whether related to other fields of study or those related to increasingly complex everyday life. Therefore, students' abilities need to be trained continuously so that they are able to solve the problems at hand (Rosidah *et al.*, 2018).

This shows the need for problem solving for high school students. According to Soekardjo & Sugiyanta (2018), if the learning stage only starts with activities that are memorizing or answering written questions, students' thinking skills will only increase in terms of writing and answering written questions. To deal with problems in everyday life, both globally or technologically, it is very important for students to practice their learning process to overcome authentic problems around them.

CONCLUSION

The results of 84% with "almost all" criteria from this study indicate that the school exam questions are of the HOTS type. The percentage of characteristics on the item questions with the criteria of "almost all". 94.2% of the item items matched the indicators of competency achievement. Half of the stimulus forms applied to the questions in the problem are pictures, while a small part are tables, diagrams, examples, and less than half are case fragments. While the characteristics of critical thinking questions are 44.24%, less than half of them are indicators that focus on questions. The characteristics of problem solving questions are only 26.23%, of which the "small part" category is an indicator of identifying problems, solving problems based on facts and problems and identifying problems that are not appropriate.

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