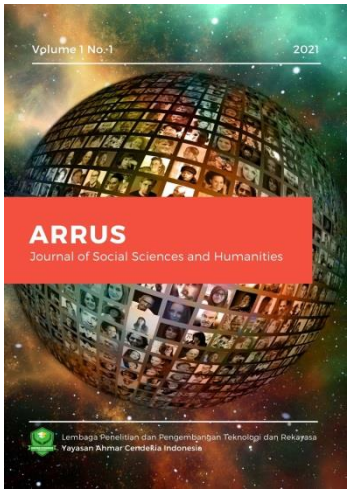
https://doi.org/10.35877/soshum3390

OPEN ACCESS

ISSN: 2776-7930 (Print) / 2807-3010 (Online)



RESEARCH ARTICLE

Analysis Of Students Higher Order Thinking Skills Reviewed From The Speed Of Answering Science Questions

Rifda Nur Hikmahwati Arif[1]*, Sitti Saenab[1], Sulastri[1], Salma Samputri[1], M. Arifuddin Jamal[2], Rifda Mardian Arif[3]

[1]Universitas Negeri Makassar, Makassar, Indonesia.
[2]Universitas Lambung Mangkurat, Banjarmasin, Indonesia.
[3]Universitas Negeri Gorontalo, Gorontalo, Indonesia

*Corresponding author: Rifda Nur Hikmahwati Arif, Universitas Negeri Makassar, Makassar, Indonesia

E-mail: rifdanha@unm.ac.id

Abstract: This study aims to analyze 1) The Score of Higher-Order Thinking Skills (HOTS) of International Class Program (ICP) students of Science Education Study Program FMIPA UNM, 2) The Score of Higher-Order Thinking Skills (HOTS) of International Class Program (ICP) students in relation to the speed of answering questions. This is a descriptive quantitative research involved 18 students, with an instrument in the form of a Quizizz application-based test. Data were analyzed descriptive statistic based on the distribution of correct answer values and also the time to answer the science questions. The results of the research showed that: (1) The average score of higher order thinking skills of IPA ICP FMIPA UNM students was 42,8 in a medium category. The frequency of students were in the categories Very high was 0% , high was 17%, medium was 33%, low was 44% and Very low was 16%. (2) Students who answered at a moderate speed (21-30 seconds) had the highest average score of 66.67, indicating that moderate time management provides better results than a very fast speed (0-10 seconds) or very slow (≥41 seconds), with scores of 36.67% and 44.17% respectively. This research confirms that moderate management of answering time supports better learning outcomes. To improve HOTS abilities, it is recommended to implement problem-based learning and regular practice of HOTS questions.

Keywords: Higher Order Thinking Skills, Speed Of Answering Questions, HOTS-Based Learning, ICP Science Students

1. INTRODUCTION

Higher order thinking skills (HOTS) according to Bloom (Moore & Stanley, 2010) include the abilities of analysis, synthesis, and evaluation. In its development, Bloom's Taxonomy structure has been revised by Anderson and Krathwohl (2010), who replaced the level of synthesis with "creating" as the highest level, as well as establishing a new order: analysis, evaluation, and creating, in order to adapt to the learning needs of the 21st century. In the era of the industrial revolution 4.0, education is required to produce individuals who not only have theoretical mastery of the material, but also higher order thinking skills (HOTS). HOTS includes the ability to analyze, evaluate, and create which are important to face global challenges. Anderson and Krathwohl (2001) in the revision of Bloom's Taxonomy mentioned that HOTS allows a person to solve complex problems critically and creatively.

https://doi.org/10.35877/soshum3390

ISSN: 2776-7930 (Print) / 2807-3010 (Online)

As one of the flagship programs, the International Class Program (ICP) FMIPA UNM is designed to produce graduates who are competitive at the international level. This program requires students to have critical thinking skills, especially in understanding and solving HOTS-based problems. However, research shows that there are still many students who are at the Lower Order Thinking Skills (LOTS) level, which hampers the effectiveness of HOTS-based learning, answering questions is an important indicator to evaluate students' thinking skills. Research conducted by Sugiyanto et al. (2019) showed that students with high answering speed tend to have better concept understanding. On the other hand, another study by Jatmiko et al. (2021) revealed that variability in answering speed can be influenced by internal factors, such as motivation and self-efficacy, as well as external factors, such as teaching methods and the quality of the questions, the role of HOTS-based learning in science subjects is a major concern. According to Yuliani & Saragih (2020), HOTS questions in science serve to hone students' skills in integrating knowledge and solving authentic problems. However, the main challenge lies in preparing questions that are relevant to the HOTS dimension, research conducted by Nurhasanah et al. (2020) concluded that HOTS can improve students' critical thinking if accompanied by high time management when answering questions. This shows that analyzing the speed of answering questions is very relevant to understanding the extent to which students are able to reach higher levels of thinking. This study aims to analyze the higher order thinking skills of ICP FMIPA UNM science students, especially in relation to the speed of answering questions. The results of this study are expected to make a significant contribution in improving the quality of HOTS-based learning and become a guideline for future curriculum development.

2. Research Method and Materials

This research is descriptive research with a quantitative approach. The research design used is descriptive using instruments. The object of this research is ICP students of science education study program FMIPA UNM. This study uses a test instrument in the form of the Quizizz application with HOTS question characteristics. This research consists of three stages, namely the preparation stage, the implementation stage, and the final stage. In the preparation stage, activities such as making research instruments, and validating instruments were carried out. The implementation stage includes giving direct tests to students using the prepared instruments. Finally, in the final stage, data collection, data processing, data analysis are carried out. The data was analyzed with the following steps; classification of correct answer values into HOTS categories (Very high, high, medium, Lack, and Very Lack). Classification of answer time into speed categories (very fast, fast, medium, slow, and very slow). Calculation of the percentage and average of each category to understand the pattern of students' thinking skills. Furthermore, the preparation of discussions and conclusions.

Table 1. Conversion Table

Interval Nilai	Category
81 - 100	Very High
61 - 80	High
41 - 60	Medium
21 - 40	Low
0-20	Very low

(Adaptation from Ratumanan dan Laurens, 2015)

3. Results and Discussion [11pt, Garamond, Bold, Justified]

Penelitian ini mengeksplorasi hubungan antara kecepatan menjawab soal berbasis *Higher Order Thinking Skills* (HOTS) dengan kemampuan berpikir mahasiswa program International Class Program (ICP) di FMIPA UNM. The main focus lies on identifying the pattern of students' thinking skills based on the value of correct answers and the category of speed of answering questions. In the context of 21st century education, higher-order thinking skills, such as analysis, evaluation, and creation, are the main competencies that students must have to face global challenges (Anderson & Krathwohl, 2001).

https://doi.org/10.35877/soshum3390

ISSN: 2776-7930 (Print) / 2807-3010 (Online)

Table 2. The value of higher order thinking ability of ICP 2022 IPA FMIPA UNM students in terms of correct answers.

Intervals	Category	Frequency	Percentage (%)
81-100	Very High	0	0%
61-80	High	3	17%
41-60	Medium	6	33%
21-40	Low	8	44%
0-20	Very low	1	6%
Total		18	100%

The distribution of high-level thinking skills (HOTS) scores of ICP 2022 Science FMIPA UNM students shows that the majority of students are in the Lack category with a percentage of 44% (8 students), followed by the medium category as many as 33% (6 students). Only 17% of students were in the high category (3 students), while none reached the Very high category. In contrast, there were 6% of students (1 student) who fell into the Very low category. This data indicates that in general, students' understanding of HOTS-based questions is still weak, with most of them unable to reach an adequate level of mastery.

This phenomenon reflects the need to improve the quality of learning that focuses on developing HOTS, especially in terms of analysis, evaluation, and creation. Based on previous research, one of the obstacles that often arises is the lack of opportunities for students to be involved in learning processes based on exploration, discussion, or challenging problem solving. Conventional learning methods that dominate the class could be the main cause of the lack of HOTS mastery. Therefore, it is important for educators to improve teaching strategies, for example by providing more HOTS-based problem exercises, project-based learning, or group discussions to encourage students to think critically and creatively in solving complex problems.

Based on the Table 2. the average score for each student the students' higher order thinking skills (HOTS) scores are in a varied range. Average Score Distribution: The highest score is 66,67 with high category of high order thinking skill achieved by student S1 . The lowest score was 16.7, achieved by student S18. The overall average was 42.8 in medium category of high order thinking skill , which shows that in general, students' ability to answer HOTS-based questions is still relatively medium. Classification Based on Score Category: When referring to the high-level thinking skills score categories outlined in the document (Very High, High, Medium, Low, Very Low): Only 17% of students reached the High category, while no students fell into the Very High category.

Table 2. The average score of ICP 2022 science students FMIPA UNM

No	Name	Score
1	S1	66.67

https://doi.org/10.35877/soshum3390

ISSN: 2776-7930 (Print) / 2807-3010 (Online)

2	S2	63.33
3	S3	60.00
4	S4	63.33
5	S5	60.00
6	S6	46.67
7	S7	46.67
8	S8	50.00
9	S9	46.67
10	S10	40.00
11	S11	36.67
12	S12	30.00
13	S13	26.67
14	S14	26.67
15	S15	33.33
16	S16	33.33
17	S17	23.33
18	S18	16.67
Average Score		42.78

Table 3. The value of the ability to think at a high level of ICP 2022 IPA FMIPA UNM students in terms of the speed of answering questions

Category		Frequency	Percentage (%)	Average	Score	category
Very fast	0-10 seconds	7	39%	11	36,67	Low
Fast	11-20 seconds	5	28%	13,2	44	Medium
Medium	21-30 seconds	1	6%	20	66,67	High
Slow	31-40 seconds	1	6%	15	50	Medium
Very Slow	≥ 41 seconds	4	22%	13,25	44,17	Medium
		18	100%			

The distribution of students based on the speed of answering shows:

Students with moderate speed (21-30 seconds) had the highest average score (66.67 in a high category of high order thinking skill), indicating that moderate time provides an opportunity for more mature thinking. In contrast, students who answered very quickly (0-10 seconds) had a low average score (36.67 in a low category of high order thinking skill), reflecting a tendency to answer without considering in-depth analysis.

3.1. The discussion of Relationship between speed and answer quality

Very Fast Time (0-10 seconds): Students who answer too quickly tend to guess or only read part of the question. This indicates a lack of deep understanding of the material, in accordance with the findings of Nurhasanah et al. (2020) that extreme speed tends to decrease accuracy. Very Slow Time (≥ 41 seconds): Students who take a very long time to answer questions may face difficulties in understanding or analyzing questions. This reflects a lack of mastery of basic concepts and critical thinking skills.Medium Time (21-30 seconds) The highest average score in this category indicates that a balanced time allows students to understand the problem, analyze, and provide more precise answers. This study's analysis shows that students need to be trained to understand and solve HOTS-based problems using the Problem-Based Learning (PBL) methodRegular practice of HOTS questions can help improve the ability to analyze, evaluate and create. According to the previous explanation, HOTS (Higher-Order Thinking Skills) are in the cognitive domain of Bloom's Taxonomy which has been refined by Anderson and Krathwohl (2001). They classified thinking skills into six levels, namely: C1-remembering, C2-understanding, C3-applying, C4-analysing, C5-evaluating, and C6-creating. Levels one to three (remembering, understanding, and applying) belong to LOTS (Lower-Order Thinking Skills), which according to Sani (2019) are thinking skills that are mechanical and limited to repetition and memorization of information without analysis or development of new ideas.

In classroom learning, LOTS is reflected in a one-way method that is more dominated by the teacher, with students given little opportunity to think actively, and questions that rely solely on memory (Yuliati & Lestari, 2018). In contrast, according to Anggraini (2019), HOTS includes more complex thinking skills, involving creativity and criticism of problems to find

https://doi.org/10.35877/soshum3390

ISSN: 2776-7930 (Print) / 2807-3010 (Online)

solutions. Retnawati (2018) emphasizes the importance of HOTS-based learning and assessment to familiarize students with complex challenges, while developing innovative ideas and solutions. Given that each student has unique abilities, a consistent approach is needed to help them achieve various cognitive levels in learning.

In HOTS learning, the process is two-way, where teachers and students interact with each other. Students are given more space to explore and solve problems independently, and the questions asked focus on problems, analysis, evaluation, and decision making (Sani, 2019). Research by Putriyani (2014) showed that students who were taught using the PBL model had an average higher-level thinking ability of 78.00, which was classified as a high category. In the application of PBL which is supported by LKS, Students are directed to analyze the problem by identifying the components of the problem, choosing the most suitable solution, and designing work that helps them convey the results of problem solving effectively.

4. Conclusion

The results of the research showed that:

The average score of higher order thinking skills of IPA ICP FMIPA UNM students was 42,8 in a medium category, frequency of students were in the categories Very high was 0% , high was 17%, medium was 33%, low was 44% and Very low was 16%.

Students who answered at a moderate speed (21-30 seconds) had the highest average score of 66.67, indicating that moderate time management provides better results than a very fast speed (0-10 seconds) or very slow (≥41 seconds), with scores of 36.67% and 44.17% respectively. This research confirms that moderate management of answering time supports better learning outcomes. To improve HOTS abilities, it is recommended to implement problem-based learning and regular practice of HOTS questions.

References

Anastasi, A., & Urbina, S. (1997). Psychological Testing. Membahas bagaimana waktu respons dapat dijadikan salah satu indikator kinerja pada tes.

Anderson, L.W., & Krathwohl, D.R. (2001). A Revision of Bloom's Taxonomy of Educational Objectives. New York: Longman.

Anggraini, N. P., Budiyono, & Pratiwi, H. (2019). Analysis Of Higher Order Thinking Skills Students at Junior High School in Surakarta. Journal of Physics: Conference Series, 12(1), 1–9.

Arikunto, S. (2016). Dasar-dasar Evaluasi Pendidikan. Buku ini menjelaskan teknik evaluasi hasil belajar, termasuk pengelompokan nilai berdasarkan rentang.

Jatmiko, T., et al. (2021). Variabilitas Kecepatan Menjawab dalam Konteks HOTS. Journal of Educational Psychology, 12(3), 45-58.

Moore, K., & Stanley, P. (2010). Higher Order Thinking Skills and Educational Frameworks. Boston: Academic Press.

Nurhasanah, S., et al. (2020). The Role of Time Management in Improving Critical Thinking Abilities. Bandung: Science Press.

Purwanto, N. (2010). Prinsip-Prinsip dan Teknik Evaluasi Pengajaran. Buku ini menyoroti penerapan kategori kualitatif pada hasil evaluasi numerik.

Putriyani, (2014), Penggunaan LKS berbasis Problem Based Instruction untuk Meningkatkan Keterampilan Berpikir Tingkat Tinggi Siswa pada Konsep Jamur, Skripsi, Fakultas Ilmu Tarbiyah dan Keguruan, UIN Syarif Hidayatullah, Jakarta

Ratumanan, T. G., & Laurens, T. 2015. Penilaian Hasil Belajar Pada Tingkat Satuan Pendidikan Edisi Ke 3. Yogyakarta: Pensil Komunika.

Retnawati, H., Djidu, H., Kartianom, Apino, E., & Anazifa, R. D. (2018). Teachers' knowledge about higher order thinking skills and its learning strategy. Problems of Education in the 21st Century, 76(2), 215– 230

Sani, R. (2019). Pembelajaran Berbasis HOT (Higher Order Thinking Skill). Tanggerang: Tira Smart

Sugiyanto, D., et al. (2019). Analysis of Higher Order Thinking Skills in Science Education. International Journal of Educational Research, 14(2), 89-102.

https://doi.org/10.35877/soshum3390

ISSN: 2776-7930 (Print) / 2807-3010 (Online)

Yuliani, M., & Saragih, S. (2020). HOTS-based Assessments in Science Education. Science Learning Journal, 8(1), 101-110.

Yuliati, S. R., & Lestari, I. (2018). Higher-Order Thinking Skills (Hots) Analysis of Students in Solving Hots Question in Higher Education. Perspektif Ilmu Pendidikan, 32(2), 181–188