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Higher Order Thinking Skills Analysis on Problems in Class XI SMA Physics Books

Sudirman^{1*}, Saparini¹, Fathiyah Yasmin¹, and Muhammad Saukani²

¹Physics Education, Universitas Sriwijaya, Palembang, Indonesia

²International PhD program in Biomedical Engineering, Taipei Medical University,
Taiwan

*sudirman@fkip.unsri.ac.id

DOI:10.20527/bipf.v11i3.15836

Received: 11 March 2023

Accepted: 4 July 2023

Published: 28 December 2023

Abstract

Currently, schools are expected to be able to train students to get used to solving higher-order thinking questions, one of which is through the textbooks the teacher chooses to teach. This study aimed to analyze the types of Higher Order Thinking Skills (HOTS) questions in Physics textbooks for class XI students. Data was collected using documentation techniques. The documents are physics textbooks from four publishers: Erlangga, Grafindo, Yrama Widya, and Intan Pariwara. Data analysis in the form of the percentage of HOTS questions in each book was calculated quantitatively and then discussed qualitatively related to these results. The results showed that the distribution of HOTS questions in (1) Erlangga textbooks was 8% in chapter 1 and 8% in chapter 2; (2) Grafindo textbooks by 20% in chapter 1 and 20% in chapter 2; (3) Yrama Widya textbooks by 43% in chapter 1 and 50% in chapter 2; (4) Intan Pariwara textbooks by 55% in chapter 1 and 40% in chapter 2. Among the four textbooks, the book published by Intan Pariwara has the highest distribution of HOTS questions. Based on this result, teachers can use this book to carry out learning evaluations to measure students' HOTS abilities.

Keywords: Analysis; Higher Order Thinking Skills; HOTS distribution; Physics book

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How to cite: Sudirman, S., Saparini, S., Yasmin, F., & Saukani, M. (2023). Higher order thinking skills analysis on problems in class XI SMA physics books. *Berkala Ilmiah Pendidikan Fisika*, 11(3), 290-299.

INTRODUCTION

Competencies and skills that must be possessed by students in the 21st century include (1) critical thinking and problem-solving skills, (2) collaboration and leadership, (3) agility and adaptability, (4) initiative and entrepreneurial spirit, (5) able to communicate effectively, (6) able to access and analyze information, (7) have curiosity and imagination (Wagner, 2010). Learning is needed to achieve the expected competencies and skills.

Learning itself can be interpreted as a learning process created by educators to improve students' thinking skills, creativity, knowledge organization, problem-solving, and mastery of teaching materials well (Rashidov, 2022; Syahputra, 2018).

In the 21st century, humans face the era of globalization, which demands high-level thinking skills (Jaenudin et al., 2020; Mutiani & Faisal, 2019). Higher-order thinking, commonly referred to as



Higher Order Thinking Skills (HOTS), is a thinking process that involves mental activity to explore complex, reflective, and creative experiences that are carried out consciously to achieve goals (Hidayat et al., 2020; Miterianifa et al., 2021). Thinking is not just remembering or retelling some information but requires students to understand it, conclude, connect it with other information, and apply it by finding solutions to complex problems (Abduh & Istiqomah, 2021; Istiyono, 2017).

HOTS has created students who can solve problems in any situation to increase learning outcomes (Cahyawati & Sholeh, 2020; Soeharto & Rosmaiyadi, 2018). Students' low-level thinking skills are only directed at remembering and understanding a problem without having to solve and find solutions to the problem. Therefore, these low-level thinking skills cannot be used in current learning. This is caused by having higher-order thinking skills; students must understand, analyze, and solve or find solutions to a problem in learning physics (Halim et al., 2021; Milia et al., 2022).

Higher-order thinking skills, or HOTS, can be implemented in various learning environments, including learning facilities and infrastructure. Books are one of them. HOTS learning focuses on higher-order thinking skills that challenge students to think critically and creatively, collaborate, and communicate (Agustina et al., 2021; Ariyana et al., 2018). This is done to improve students' ability to solve problems, make the right decisions, think critically, and think creatively (Amalia & Wahyuni, 2021; Syafrinaldi et al., 2020). In addition, applying HOTS in education aligns with the objectives of the 2013 curriculum because it will become an asset for students who face a fluctuating and complex life in the future.

The 2013 curriculum is a new curriculum that aims to improve the quality of education in Indonesia. The

2013 curriculum textbook introduces the 2013 curriculum, which will be used to develop students' character and intelligence. This textbook then becomes a reference book for all educational units in Indonesia. The 2013 curriculum program is expected to be able to develop students' skills so that they are ready to compete in the international arena and create a generation that can work with today's industry. These superior graduates are obtained through learning (Sayekti, 2019).

Textbooks can be key to student success or failure (Mukundan et al., 2013). Thus, to achieve competence in the 21st century, the curriculum uses programs that can enhance high-level thinking skills taught through textbook exercises. Developing skills requires practice. Therefore, to develop HOTS skills, students need to practice answering questions containing HOTS (Arifin & Retnawati, 2015).

Several studies are the reasons behind this research, such as research conducted on junior high school students, which found that the category of students' high-level thinking skills in dynamic electrical physics material is still relatively moderate (Rahmawati et al., 2019). In addition, HOTS content on high school exam questions in physics is still lacking (Salsa et al., 2021). There is also research conducted in high school physics books on direct current electricity; the HOTS content contained is still below 40% (Tunga & Jumadi, 2022). Syafrinaldi et al. (2020) examined the HOTS levels found in class XI physics worksheets used by several high schools in West Sumatra. The results obtained, the average HOTS level found in each worksheet was classified as a less available category. Based on a needs analysis conducted by Hartik et al. (2021), learning must be integrated with HOTS. One way to integrate HOTS is to increase HOTS content in textbooks. This study will analyze the HOTS content in

practice questions in class XI physics textbooks, especially on the material Equilibrium of Rigid Bodies and Elasticity. So the authors conducted a study entitled "Analysis of Higher-Level Thinking Skills in the Questions in Class XI High School Physics Books". Based on the title, the objective can be drawn to present the results of the HOTS analysis contained in the questions in class XI high school physics books.

METHOD

The research used in this research is descriptive research with a qualitative approach, which aims to find out whether HOTS is available in Class XI High School Physics Books. Descriptive research is the most basic form of research (Setyosari, 2013; Sukmadinata, 2016). It aims to describe or explain existing phenomena, both natural and ergonomic. A qualitative approach is a study that produces descriptive data in written or oral form from people and observed behavior (Fitri & Haryanti, 2020; Yuberti & Saregar, 2017).

The research was carried out by studying the literature on the questions in the physics book for class XI high school, then analyzing the questions in the physics book for class XI high school, presenting the results and discussion, and then providing conclusions.

The data collection technique used in this study was carefully reading and recording the questions in class XI high school physics textbooks. Furthermore, data collection was carried out using a question analysis sheet. The analysis sheet instrument was used to obtain in-depth data regarding practice questions in the Class XI High School Physics book regarding the Higher Order Thinking Skills (HOTS) question criteria.

After the data is collected, the percentage of each cognitive domain and cognitive aspect is calculated using the following equation.

$$P = \frac{\Sigma x}{n} \times 100\% \dots\dots\dots(1)$$

Information:

P = Percentage of each aspect of the cognitive domain level (%)

Σx = The number of questions that contain the level of cognitive aspects

n = The total number of questions

After the HOTS percentage is calculated, data availability is determined, as shown in Table 1.

Table 1 HOTS availability category

Percentage	Category
81%-100%	Highly available
61%-80%	Available
41%-60%	Enough available
21%-40%	Less available
0%-20%	Not available

Source: Riduwan's modification (Riduwan, 2019)

Furthermore, the analysis results will be presented in a narrative text, tables, and graphs to show the overall picture of this study. After that, an analysis of the cognitive level in each question will be carried out based on the composition and percentage obtained. Then, the last step is to conclude so that we can know the level of each cognitive dimension and cognitive aspect given in the class XI SMA Physics book.

RESULT AND DISCUSSION

In this study, the Physics textbooks for Class XI Senior High School to be analyzed consisted of four books from different publishers. The following publishers include Erlangga publisher, then given the symbol A, Grafindo publisher, then given the symbol B, Yrama Widya publisher, then given the symbol C, and Intan Pariwara publisher, then given the symbol D.

The sub-discussion that will be analyzed from each book is the Equilibrium of Rigid Bodies and Elasticity. Each book has a different

number of questions. The questions from each book that will be analyzed are listed in Table 2.

Table 2 The questions that will be analyzed from each book

Book Publisher	Part of the problem being analyzed
A	Practice Questions Chapter 1 Practice Questions Chapter 2
B	Chapter 1 Competency Test Chapter 2 Competency Test
C	Introductory Questions Chapter 1 Introductory Questions Chapter 2
D	Daily Assessment Chapter 1 Daily Assessment Chapter 2

Components of HOTS Questions in Physics Book A

The 'Buku Fisika SMA Kelas XI terbitan tahun 2021' book published in 2021 uses the revised 2013 curriculum as a reference. The book consists of 12 chapters corresponding to the number of basic competencies in physics class XI, which refers to the revised 2013 curriculum.

In this book, the part of the questions analyzed is the 'Soal Latihan Bab 1' and 'Soal Latihan Bab 2', each of which consists of 25 questions. The items are then entered into the instrument table, and the HOTS content in each question is analyzed.

Based on the analysis results in Figure 1, on the subject of Rotational Dynamics and Rigid Bodies Equilibrium, two questions have HOTS content with a percentage of 8% of the total number of questions. The HOTS criteria met by these questions based on revised Bloom's taxonomy are C4 with attribution sub-criteria because, in this problem, there is a stimulus in the form of an image; the question invites students to find concepts, meanings, and relationships from the data presented in the problem and seek solutions to the problem. This coincides

with the process of cognitive analysis, where students are asked to determine the relationship between how the element or stimulus presented works (Ariyana et al., 2018; Gunawan & Paluti, 2017). Furthermore, C6 criteria with formulating sub-criteria, because in the problem there is a stimulus in the form of an image, the question invites students to determine and classify images. Based on Riduwan's modified table (Riduwan, 2019), it can be concluded that the distribution of HOTS in this subject in books published by Erlangga is still unavailable.

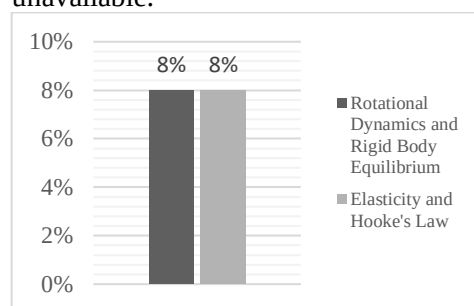


Figure 1 The results of the analysis in book A

Regarding Elasticity and Hooke's Law, two questions have HOTS content, with a percentage of 8% of the total number of questions. With the HOTS criteria that are met each in the form of C4 with attributing sub-criteria, because in the problem there is a stimulus in the form of a graph, students are asked to discover concepts, meanings, and relationships from the data presented in the problem and find solutions to the problem. Thus, based on Table 1 (Riduwan, 2019), this subject's HOTS availability category is still unavailable.

HOTS Content in Physics Book B

'Buku Fisika SMA Kelas XI terbitan Grafindo' is a book that was published by Grafindo in 2022. This book was compiled by Adityo Suksmono, Ganis Sanhaji, and Rani Nopriyanti and is composed of 13 chapters that refer to the

basic competencies in physics class XI in the 2013 revised curriculum.

In this book, the parts of the questions analyzed are the 'Uji Kompetensi Bab 1' and 'Uji Kompetensi Bab 2', each consisting of 20 questions. Furthermore, the questions were analyzed for the HOTS content contained in them.

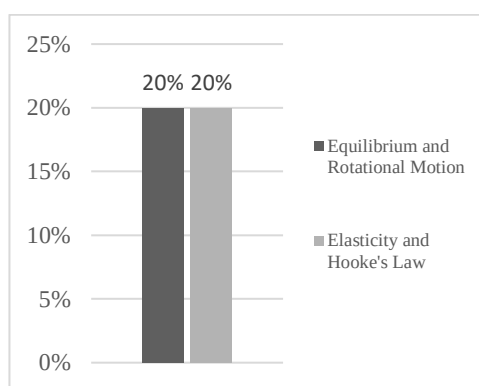


Figure 2 The results of the analysis in book B

Based on the analysis results in Figure 2, on Equilibrium and Rotational Motion, there are four questions with HOTS content, which is 20% of the total. The HOTS criteria met by each item are C4 criteria with distinguishing sub-criteria. These questions fall into criterion C4 because the questions invite students to select data in pictures relevant to solving the problem (Ariyana et al., 2018; Gunawan & Paluti, 2017). With a percentage of 20%, based on Riduwan (2019), the HOTS availability category in this sub-discussion is still not available.

Regarding Elasticity and Hooke's Law, four questions have HOTS content, which is 20% of the total. With details, 1 question fulfills criterion C5 on the sub-criteria for assessing because the question invites students to determine whether a statement is true or false and determines reasons. Furthermore, the other three questions meet HOTS C4 criteria with the attribution sub-criteria because, in the questions, students are invited to find concepts, meanings, and

relationships from the data presented (Ariyana et al., 2018; Gunawan & Paluti, 2017). Based on Riduwan's table (Riduwan, 2019), the HOTS availability category in this sub-discussion is unavailable.

HOTS Content in the Physics Book C

The book 'Penuntun Belajar Fisika SMA Kelas XI' published by Yrama Widya, contains basic concepts, examples of questions and discussion, and introductory and consolidation questions. The book compiled by Marthen Kanginan is based on the 2013 curriculum. This book consists of 9 discussion chapters.

The sections analyzed from this book are the 'Soal Pengantar Bab 1' and 'Soal Pengantar Bab 2'. In Soal Pengantar Bab 1, there are 70 questions, and in Soal Pengantar Bab 2, there are 20 questions. This question will be analyzed how many of them have HOTS content.

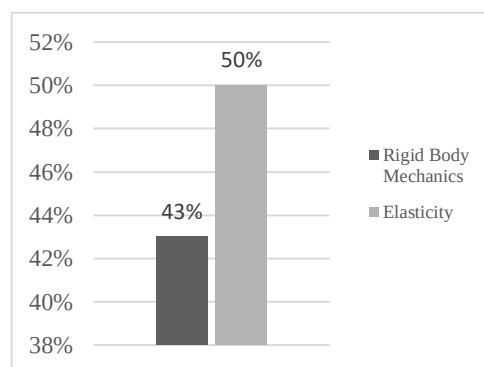


Figure 3 The results of the analysis in book C

Based on the analysis results in Figure 3, on the subject of Rigid Body Mechanics, 30 questions have HOTS content, 43% of the total number of questions. Where the criteria and sub-criteria that are met in the question include C4 with different sub-criteria, the question meets these criteria because it invites students to select data contained in the discourse and correlate it to solve the problem. Furthermore, the HOTS criterion that is fulfilled is C4 with the

attribution sub-criteria; the question is said to be included in this criterion because the item has a stimulus in the form of an image or a graph that encourages students to find out the concept of the stimulus presented and the relationship of the data presented in the image and look for a solution to the problem. After that, some questions meet HOTS C5 criteria with sub-criteria for compiling hypotheses; questions can be included in this criterion because the questions invite students to establish a provisional conjecture based on information from the pictures in the problem. In addition, some questions ask students to determine whether a statement is true or false and determine reasons so that it is categorized into C5 with sub-criteria judging (Ariyana et al., 2018; Gunawan & Paluti, 2017). Then, there are also HOTS questions that meet criteria C6 with sub-criteria for formulating; this is because there are questions that invite students to determine alternative solutions to solving problems. With a total percentage of 43%, this sub-discussion can be categorized as enough available by Riduwan's modification table (Riduwan, 2019).

Meanwhile, in Elasticity, ten questions have HOTS content with a percentage of 50% of the total number of questions. The details of the HOTS criteria contained in the questions are C4 with the sub-criteria to distinguish and attribute, criterion C5 with the sub-criteria for assessing, and criterion C6 with the sub-criteria for formulating and building. Questions that meet sub-criteria C4 are different from inviting students to choose the right information and relate it to existing problems to solve the problem. Furthermore, questions that meet the attributing sub-criteria have a stimulus in the form of a graph; students are asked to find (discover) the concept, meaning, and relationship of the data presented in the problem and look for a solution to the problem. Questions with HOTS C5

criteria with sub-criteria judging because two reasons must be determined for truth in the question, and a relationship between the two statements is sought.

Furthermore, for criterion C6, when formulating sub-criteria, some questions encourage students to choose the data contained in the problem and correlate it to solve the problem. Then, the question is said to fit into criterion C6 with the sub-criteria building because the question invites students to draw conclusions based on the statements contained in the problem (Ariyana et al., 2018; Gunawan & Paluti, 2017). Based on Riduwan (2019), this subject is included in the enough available category.

HOTS Content in the Physics Book D

This book, published by Intan Pariwara, has the full title 'Buku Interaktif Fisika untuk SMA/MA Kelas XI Semester 1' and will be published in 2021. This book is equipped with HOTS questions referring to the Minister of Education and Culture RI Number 37 of 2018. The book was compiled by Fery Widiyanto, Era Prihamita, and Yohanes Eko Cahyono and consists of 6 sub-discussions.

In this book, questions will be analyzed in the 'Penilaian Harian' sections of chapter 1 and chapter 2, each consisting of 20 questions. Each of these items will be analyzed for the HOTS content contained therein.

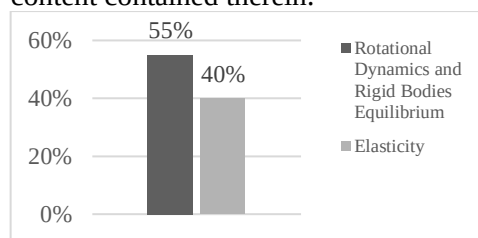


Figure 4 The results of the analysis in book D

Based on the analysis results in Figure 4, on the subject of rotational dynamics and rigid body balance, 11 questions have HOTS content, representing 55% of the total number of questions. In this sub-

discussion, there are questions that invite students to choose the data contained in the picture and correlate it to solve the problem so that it can be included in HOTS C4 criteria with different sub-criteria. Furthermore, some questions meet C4 criteria with attributing sub-criteria because these questions have a stimulus in the form of images or graphics that students can analyze the concepts, meanings, and relationships of the data presented in the questions and find solutions to the problems. In addition, there are also questions that have two statements, which encourage students to assess the relationship between these statements and determine which statement is correct (Ariyana et al., 2018; Gunawan & Paluti, 2017). Then, some questions meet criterion C5 with sub-criteria for compiling hypotheses with questions that ask students to enforce temporary conjectures based on the information contained in the questions. In addition, some questions meet criteria C6, which has formulating sub-criteria. This is because the question has a statement and asks students to formulate alternative solutions to solving the problem. With a total HOTS percentage of 55%, this sub-discussion falls into the category of enough available HOTS distribution based on Riduwan's table (Riduwan, 2019).

Meanwhile, on the subject of Elasticity, eight questions have HOTS content, with a percentage of 40% of the total number of questions. The questions in this sub-discussion meet HOTS C4 criteria with different sub-criteria because there are tables that encourage students to correlate them with the problems in the questions. In addition, some questions have a stimulus in the form of a graphic that must be translated by students in order to be able to solve the problems contained in the problem so that these questions meet criterion C4 with the attribution sub-criteria. Furthermore, there are also questions

with criterion C5 and sub-criteria for assessing, where in these questions, students are asked to determine whether a statement is true or false and determine reasons. Then some questions meet HOTS C5 criteria with predictive sub-criteria, where students are asked to systematically estimate the events that are most likely to occur based on the data presented in the questions. According to Riduwan (2019), this subject falls into the category of less available.

Comparison of HOTS Percentage of Each Book

The percentage of higher-order thinking skills from the four books can be presented as follows in Figure 5.

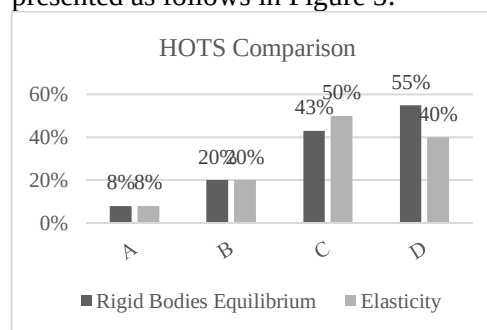


Figure 5 The percentage of higher-order thinking skills from the four books

From the four books analyzed, books published by Erlangga have an average HOTS content of 8%. The books published by Grafindo have an average HOTS content of 20%. The physics book published by Yrama Widya has a HOTS content of 46%. Then, the physics book published by Intan Pariwara has an average HOTS content of 47%.

Based on these data, it can be concluded that high school physics textbooks published by Intan Pariwara are the books with the highest percentage of HOTS distribution. Based on Table 2, the availability of HOTS in this book is still in the less available category, with an average percentage of 47%.

Following the results of the research of Anggraeni et al. (2023), it can be seen

that of the books that have been analyzed, the HOTS content contained in physics books is still low. Even in the Final Year assessment (PAT), the HOTS contents still dominate by C4 criteria (Dewangga & Sunarti, 2022). The HOTS criteria that are still lacking in the practice questions are C5 and C6.

CONCLUSION

Based on the results of research that have been done regarding HOTS analysis in class XI high school physics books, the distribution of HOTS in high school physics books published by Erlangga is 8% in chapter 1 and 8% in chapter 2 with both subjects, including in the not available category. The distribution of HOTS in high school physics books published by Grafindo is 20% in chapter 1 and 20% in chapter 2, with both subjects falling into the not available category. The distribution of HOTS in high school physics books in Yrama Widya's publications is 43% in chapter 1 and 50% in chapter 2, with both subjects included in enough available categories. Meanwhile, the distribution of HOTS in high school physics books published by Intan Pariwara is 55% in chapter 1, included in the available category, and 40% in chapter 2, included in the less available category. The high school physics book that has the most HOTS distribution is the one by Intan Pariwara. This research is expected to provide implications for teachers to choose questions that will be used in learning so that the overall cognitive level can be absorbed by students properly.

REFERENCES

- Abduh, M., & Istiqomah, A. (2021). Analisis muatan hots dan kecakapan abad 21 pada buku siswa kelas v tema ekosistem di sekolah dasar. *Jurnal Basicedu*, 5(4), 2069–2081.
- Agustina, L., Feronika, T., & Yunita, L. (2021). Analysis of higher order thinking skills questions in the brookhart category in high school chemistry textbook: Curriculum 2013. *Journal of Educational Chemistry (JEC)*, 3(1), 23–34. <https://doi.org/10.21580/jec.2021.3.1.6546>
- Amalia, R. F., & Wahyuni, S. (2021). Analysis of higher order thinking skills (hots) content of sbmptn physics problems. *Journal of Physics: Conference Series*, 1918(5), 1–6. <https://doi.org/10.1088/1742-6596/1918/5/052055>
- Anggraeni, C. D., Junus, M., & Damayanti, P. (2023). Analisis soal latihan pada buku soal fisika kelas xi berdasarkan taksonomi bloom revisi dilihat dari prespektif higher order thinking skill pada pokok bahasan fluida. *Jurnal Literasi Pendidikan Fisika (JLPF)*, 4(1), 40–51.
- Arifin, Z., & Retnawati, H. (2015). Analisis instrumen pengukur higher order thinking skills (hots) matematika siswa sma. *Seminar Nasional Matematika Dan Pendidikan Matematika UNY*, 20, 783–790.
- Ariyana, Y., Pudjiastuti, A., Bestary, R., & Zamromi, Z. (2018). Buku pegangan pembelajaran keterampilan berpikir tingkat tinggi berbasis zonasi. *Direktorat Jendral Guru Dan Tenaga Kependidikan*, 1–87.
- Cahyawati, R., & Sholeh, M. (2020). Pengaruh higher order thinking skills (hots) dan manajemen kelas terhadap hasil belajar siswa di smp negeri 28 surabaya. *Jurnal Inspirasi Manajemen Pendidikan*, 08(02), 100–107.
- Dewangga, N. S. A., & Sunarti, T. (2022). Analisis soal fisika berbasis high order thinking skill dalam penilaian akhir tahun di sma. *PENDIPA Journal of Science Education*, 6(2),

- 573–579.
<https://doi.org/10.33369/pendipa.6.2.573-579>
- Fitri, A. Z., & Haryanti, N. (2020). *Metodologi penelitian pendidikan : kuantitatif, kualitatif, mixed method, dan research and development*. Madani Media.
- Gunawan, I., & Paluti, A. R. (2017). Taksonomi bloom – revisi ranah kognitif. *E-Journal.Unipma*, 7(1), 1–8. <http://e-journal.unipma.ac.id/index.php/PE>
- Halim, A., Mastura, I., Soewarno, Elisa, Mahzum, E., Farhan, A., & Irwandi, I. (2021). Analysis of students' ability in completing HOTS-based Basic Physics questions. *Journal of Physics: Conference Series*, 1882(1).
<https://doi.org/10.1088/1742-6596/1882/1/012024>
- Hartik, S., Utaminingsih, S., & Madjdi, A. H. (2021). A need assessment of integrated science teaching material based higher order thinking skills (hots). *Journal of Physics: Conference Series*, 1823(1).
<https://doi.org/10.1088/1742-6596/1823/1/012078>
- Hidayat, D. M. F., Adisaputera, A., & Pramuniati, I. (2020). Development of hots (high order thinking skill) based news text assessment instrument for 8th grade students in smp muhammadiyah 7 medan. *Budapest International Research and Critics in Linguistics and Education (BirLE) Journal*, 3(2), 1123–1136.
<https://doi.org/10.33258/birle.v3i2.1046>
- Istiyono, E. (2017). The analysis of senior high school students' physics HOTS in Bantul District measured using PhysReMChoTHOTS. *AIP Conference Proceedings*, 1868.
<https://doi.org/10.1063/1.4995184>
- Jaenudin, R., Chotimah, U., Farida, F., & Syarifuddin, S. (2020). Student development zone: Higher order thinking skills (hots) in critical thinking orientation. *International Journal of Multicultural and Multireligious Understanding*, 7(9), 11.
<https://doi.org/10.18415/ijmmu.v7i9.1884>
- Milia, A. H., Trisna, S., & Yanti, I. R. (2022). Development of hots assessment instruments on static electricity materials for high school level. *Berkala Ilmiah Pendidikan Fisika*, 10(1), 73.
<https://doi.org/10.20527/bipf.v10i1.11914>
- Miterianifa, Ashadi, Saputro, S., & Suciati. (2021). Higher order thinking skills in the 21st century: Critical thinking. *Proceedings of the 1st International Conference on Social Science, Humanities, Education and Society Development*, 1–10.
<https://doi.org/10.4108/eai.30-11-2020.2303766>
- Mukundan, J., Hajimohammadi, R., & Nimehchisalem, V. (2013). Developing an english language textbook evaluative checklist. *IOSR Journal of Research & Method in Education (IOSRJRME)*, 1(3), 55–70. <https://doi.org/10.9790/7388-0135570>
- Mutiani, & Faisal, M. (2019). Urgency of the 21st century skills and social capital in social studies. *The Innovation of Social Studies Jurnal*, 1(1), 1–11.
- Rahmawati, A., Nisfah, N. L., & Kusairi, S. (2019). The capability analysis of high order thinking skills (hots) on dynamic electricity material in junior high school. *Jurnal Penelitian & Pengembangan Pendidikan Fisika*, 5(2), 163–168.
<https://doi.org/10.21009/1.05211>
- Rashidov, A. S. (2022). Using of problem educational technologies in the development of students'

- creative and logical thinking skills. *Berlin Studies Transnational Journal of Science and Humanities*, 2(1.5 Pedagogical sciences), 262–274.
<http://berlinstudies.de/10.5281/zenodo.6431171>
- Riduwan. (2019). *Belajar mudah penelitian untuk guru-karyawan dan peneliti pemula*. Alfabeta.
- Salsa, B., Darvina, Y., Hufri, -, & Sari, S. Y. (2021). Analysis of availability of hots in physics exam questions at senior high school in lima puluh kota district. *Pillar of Physics Education*, 14(3), 220.
<https://doi.org/10.24036/11933171074>
- Sayekti, I. C. (2019). Analisis hakikat ipa pada buku siswa kelas iv sub tema i tema 3 kurikulum 2013. *Profesi Pendidikan Dasar*, 1(2), 129–144.
<https://doi.org/10.23917/ppd.v1i2.9256>
- Setyosari, P. (2013). *Metode penelitian pendidikan & pengembangan*. Preda Media Groupna.
- Soeharto, S., & Rosmayadi, R. (2018). The analysis of studentsâ€™ higher order thinking skills (hots) in wave and optics using irt with winstep software. *Journal of Educational Science and Technology (EST)*, 4(3), 145–150.
<https://doi.org/10.26858/est.v1i1.7001>
- Sukmadinata, N. (2016). *Metode penelitian pendidikan*. Remaja Posdakarya Offset.
- Syafrinaldi, Yulia Sari, S., Darvina, Y., & Satria Dewi, W. (2020). Analisis ketersediaan hots pada lembar kerja siswa fisika kelas xi semester 1 di sumatera barat. *Pillar Of Physics Education*, 13(3), 387–394.
- Syahputra, E. (2018). Pembelajaran abad 21 dan penerapannya di indonesia. *Prosiding Seminar Nasional SINASTEKMAPAN*, 1276–1283Medan.
- Tunga, M. F., & Jumadi, J. (2022). Content analysis of physics textbooks for senior high school on the principle of direct current circuits. *Jurnal Penelitian Pendidikan IPA*, 8(1), 414–422.
<https://doi.org/10.29303/jppipa.v8i1.1294>
- Wagner, T. (2010). The global achievement gap, 21st century skills. In *Journal of Physics D: Applied Physics* (Vol. 29, Issue 1).
<http://www.ncbi.nlm.nih.gov/pubmed/21226399>
- Yuberti, & Saregar, A. (2017). *Pengantar metodologi penelitian pendidikan matematika dan sains*. AURA.