JPPIPA 8(2) (2022)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

Level of Knowledge and Understanding of State Senior High School Science Teachers in Constructing "HOT Questions"

Rahmati[1], Yusrizal[2]*, A Halim[2], Fitria Herliana[2], Syamsul Rizal[3]

[1] Physics Education Study Program, Universitas Islam Negeri Ar-Raniry, Banda Aceh, Indonesia
[2] Physics Education Study Program, Universitas Syiah Kuala, Banda Aceh, Indonesia
[3] Physics Education Study Program, Universitas Serambi Mekkah, Banda Aceh, Indonesia

DOI: 10.29303/jppipa.v8i2.1133

Article Info
Received: November 15, 2021
Revised: March 20, 2022
Accepted: April 4, 2022
Published: April 30, 2022

Abstract: This study aims to describe the level of knowledge and understanding of state senior high school science teachers (SMAN) in constructing higher-order thinking items (HOT), and to compare the level of knowledge and understanding among state senior high school Physics, Chemistry, and Biology teachers in constructing higher-order thinking items (HOT). The type of this research is descriptive quantitative, data collection technique is done by survey method using developed questionnaire instrument. The population in this research are all science teachers (Physics, Chemistry, and Biology) of State Senior High School teachers in Aceh Province, with the sample being 90 science teachers of State Senior High School teachers which are chosen randomly. The data obtained were analyzed descriptively. The result of the research shows that: (1) the level of knowledge and understanding of science teachers of State Senior High School teachers in constructing higher-order thinking items (HOT) is in the medium category, (2) the level of knowledge and understanding in constructing higher-order thinking (HOT) items, Biology teachers achieved more high and very high category compared to Physics and Chemistry teachers.

Keywords: Level of knowledge; Level of understanding; Higher-order thinking

Citation: Rahmati, R., Yusrizal, Y., Halim, A. ., Herliana, F. ., & Rizal, S. . (2022). Level of Knowledge and Understanding of State Senior High School Science Teachers in Constructing "HOT Questions". *Jurnal Penelitian Pendidikan IPA*, *8*(2), 467–474. https://doi.org/10.29303/jppipa.v8i2.1133

Introduction

Saragih (2008) suggests that the competence of teachers is a set of knowledge, skills, and behaviors that must be owned, experienced, and mastered by teachers in performing their professional duties. Permendiknas No 16/2007 about Academic Qualification and Teacher Competency Standards stated that one of the core competencies of teachers is to conduct assessment and evaluation of process and learning outcomes. Assessment of learning outcomes is an integral part of the learning activities, even a vital thing in the education system and teaching at formal education institutions. Assessment is a series of activities to obtain, analyze, and interpret data about the process and learning outcomes of learners that are done in a systematic and continuous, so that becomes meaningful information in decision making (Widyastono, 2013). To determine the level of achievement of student learning objectives, teachers must make an assessment (Effendi, 2017). The assessment aims to determine the level of learning achievement (Noor, 2020). Implementation of assessment in science lessons is directed to the ability of science process skills, namely to obtain information about the ability or teachers' success in giving or teaching materials to students and students' skills in understanding the lesson (Arif, 2016). Gaytan & McEwen (2007) argued that assessment is an important way to respond to student accountability.

Implementation of the assessment in the learning process is very important. Implementation of the assessment is regulated in Government Regulation (PP)

* Corresponding Author: yuzrizal_fkip@unsyiah.ac.id

no. 19 the year 2005, article 63 paragraph (1) is "Assessment at the level of primary and secondary education consists of (a) assessment of learning outcomes by educators, (b) assessment of learning outcomes by educational units, and (c) assessment of learning outcomes by the government (Camellia & Chotimah, 2012). According to Carina & Mujiyono (2014), one of the main tasks of teachers is to assess learning outcomes". Assessment is the activity of processing information obtained through measurement to analyze and consider the performance of learners on relevant tasks (Hill, 1977).

The ability of teachers to conduct assessments will have a tremendous impact on the quality of graduates in each school. Assessment by a teacher should be based on standards set by the government. Winarsih & Mulyani (2012) suggests that professional teachers can manage to learn well, implicating on improving students' ability in constructing their knowledge and application in daily life. Schools that have teachers with good competence will produce good graduates (Maskuri & Anwar, 2021).

The subjects of science (physics, chemistry, and biology) have been studied by the students of SMA Negeri Aceh Province. Students should be able to answer the standard exam questions such as National Examination (UN) well (Soewarno et al, 2020). However, the students of SMA Negeri Aceh have not been able to answer the item questions with the maximum. This is seen from the results of the National Examination of students of SMA Negeri Aceh in the academic year 2016/2017 which is relatively unsatisfactory. The average score of UN Aceh in science subjects was 35.42 (physics), 41.62 (chemistry), and 37.97 (biology) (Puspendik, 2016/2017). The low UN results are certainly caused by many factors. One of the contributing factors is that high school students in Aceh are generally poorly trained in solving problems with characteristics such as UN questions that mostly reveal aspects of application and reasoning, and high-level cognitive problems, which they rarely encounter when having tests in class. The cause is predicted that science teachers have not or lack understanding and mastering it. Referring to the problem, the purposes of this research are (1) to Describe the level of knowledge and understanding of science teachers of SMA Negeri Aceh Province (2) to Describe the comparison of knowledge and understanding among the teachers of Physics, Chemistry, and Biology of the State Senior High School Aceh in preparing high-order thinking questions (Higher Order Thinking). The results of this study are expected to provide information about the knowledge and understanding of science teachers (Physics, Biology, and Chemistry) SMA Negeri Aceh in constructing higher-order thinking items for the Government of Aceh, especially for the Provincial Education Office of Aceh.

Higher-order thinking characteristics according to Thomson (2008), i.e., solving tasks where no algorithm has been taught, where justification or explanation are required, and where more than one solution may be possible "Higher Order Thinking Skill", means that high-level thinking is the ability to complete tasks -task, ie no algorithm has been taught, which requires justification or explanation and may have more than one possible solution. Rofiah, et. al (2013) suggest that Higher Order Thinking is a process of thinking that does not merely memorize and relay information that is known. Furthermore, Heong et al, (2011) suggest that Higher Order Thinking is one component of the ability to think creatively and think critically. According to Lailly & Wisudawati (2015) Critical thinking, namely the ability to analyze, create and use criteria objectively, and evaluate the data. Creative thinking, that is, the ability to use structures that behave elaborately that create new and original ideas.

Bloom's taxonomy is considered the basis for higher-order thinking (Lewy et al, 2009). According to Anderson & Krathwohl (2001), Bloom's Taxonomy revision in the cognitive domain consists of six levels: remembering, understanding, applying, analyzing, evaluating, and creating. The classification of Bloom's Taxonomy is mainly in the cognitive domain, usually, this domain is written in the abbreviation C1 for the cognitive stage of knowledge up to C6 for the stage of cognitive creation. The first three levels of Bloom's revised taxonomy: remembering, understanding, and applying are Lower Order Thinking (LOT), while the next three levels are analyzing, evaluating, and creating are Higher Order Thinking (HOT). According to Gais & Afriansyah (2017), the cognitive domain included in higher-order thinking is the domain of analysis, evaluation, and creation. Abosalem (2016) suggests that these skills have to include sub-skills such as analysis, synthesis, and evaluation, which are the highest levels in Bloom's cognitive taxonomy.

The old taxonomic distinction with the new lies at the level of synthesis, wherein the revised taxonomy the synthesis level no longer exists but is combined with the analysis. The addition is "create". The order position of "evaluation" becomes at fifth while creating at the sixth position so that the highest sphere is to "create". The corresponding level of HOT thinking is seen from Bloom's old cognitive domain of taxonomy at the level of analysis, synthesis, and evaluation, which means that when viewed in a new taxonomy this level is the same as creation. Higher-order thinking skills can be known from students' cognitive abilities at the level of analysis, synthesis, and evaluation (Kawuwung, 2011).

Writing items is an early task that teachers must do in school, before the assessment. A test as an instrument of assessment of learning outcomes should measure thinking skills at varying levels according to established

goals, ranging from lower to higher-order thinking skills. Therefore, in a test, it is necessary to note the proportion of each level of thinking skill that arises in each question. More dominating issues that measure lower-level thinking skills can influence the learning patterns of learners. In this case, learners will prefer the technique of memorization and practice questions compared to developing their way of thinking at a higher level when they want to solve a problem (Syahida & Irwandi, 2015).

Method

This research uses a descriptive quantitative approach with a development research type. The research population is all science teachers (Physics, Chemistry, and Biology) of SMAN in Aceh Province. The samples used were 90 randomly selected science teachers from each selected school representing the Regency/City. This research was conducted from March to November 2017 with science teachers of SMAN who were selected to be the research sample. The research activities follow the steps (1) develop a questionnaire instrument to assess the level of knowledge and understanding of teachers to prepare high-level questions, (2) conduct a survey of science teachers of SMAN in Aceh to know the level of knowledge and understanding of teachers in constructing high-level questions by using instrument questioner results of the development. The instrument for assessing the knowledge and understanding of high school science teachers in Aceh in preparing high-level questions was developed about the theory of developing a typical performance instrument (Gable 1986; Djaali & Muljono, 2008). Instrument validity is formed by using the Pearson product-moment correlation formula, which is the correlation between grains with their total (Pujihastuti, 2010). Validity test results obtained 18 valid items. Reliability testing is done by the Alpha Cronbach formula (Putra et al., 2014), obtaining the reliability coefficient of the instrument of 0.95. The instrument for assessing the ability to construct the problems of science teachers in SMAN uses a semantic differential type that has seven choices, in the form of a continuum scale that contains the circumstances of the teacher's habit of leveling questions. Of the seven choices of answers, respondents were asked to choose one answer that best suits the teacher's knowledge and understanding in preparing the questions.

To give a result interpretation of the analysis toward the level of knowledge and understanding of teachers in preparing the HOT question used categorization by Azwar (2012). That is:

Table 1. The level of knowledge and understanding of teachers in preparing the HOT question

X ≤ 22.5	Knowledge and understanding of constructing HOT are Very Low
22.5 < X ≤ 31.5	Knowledge and understanding in constructing HOT are Low
31.5 < X ≤ 40.5	Knowledge and understanding in constructing HOT are Medium
40.5 < X ≤ 49.5	Knowledge and understanding in constructing HOT are High
X > 49.5	Knowledge and understanding in constructing HOT is Vey High

Result and Discussion

Figure 1 can be known the level of knowledge of science teachers of State Senior High School of Aceh in preparing the HOT shows that the knowledge level of science teachers of SMA Negeri Aceh varies, namely: as many as 13% of teachers know very low category, 21% teachers know in a low category, 25 % in the moderate category, 27% high category and only 11% of teachers who know in the very high category.

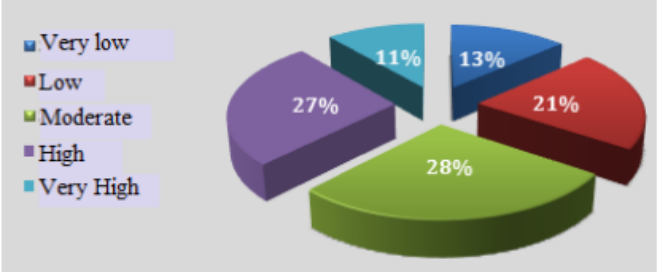

Figure 1. Knowledge Level of Science Teachers of State Senior High School constructing the HOT question

Figure 2 can be seen that the level of understanding of science teachers in preparing the HOT question is as follows. As many as 17% of teachers have an understanding in the very low category, 24% in the low category, 26% in the medium category, 22% in the high category, and only 11% of teachers have a very high level of understanding. So, it can be concluded that some teachers of Science of SMAN Aceh Province have a level of knowledge and understanding in the medium category related to making HOT questions.

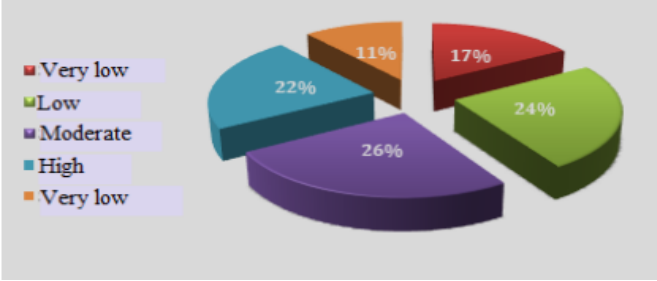

Figure 2. Understanding level of science teacher of state high school constructing the HOT question.

Figure 3 shows the level of knowledge of Physics teachers, which shows that physics teacher knowledge in HOT compilation varies, 17% of physics teachers are in the very low category, 7% in the low category, 40% in the medium category, 23% in the high category, and 13% are in the very high category. For the level of understanding of Physics teachers in HOT compilation, it can be seen that: 13% are in the very low category, 23% in the low category, 37% in the medium category, 17% in the high category, and 10% are in the very high category. Thus, the level of knowledge and understanding of physics teachers are categorized as high and very high alone respectively 36% and 27%.

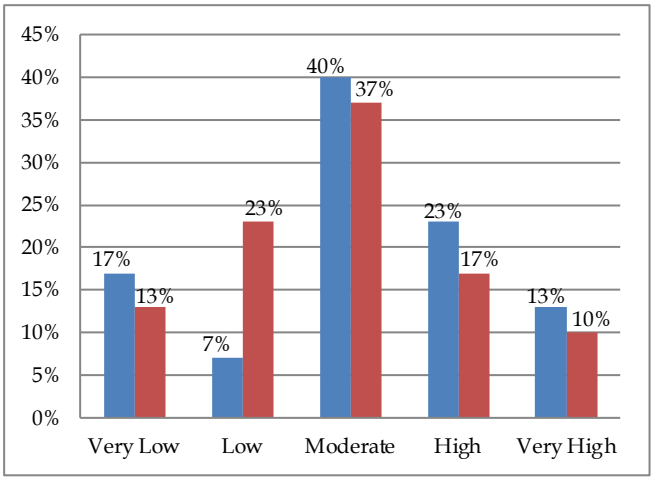

Figure 3. Knowledge and Understanding Level of Physics Teachers In Preparing HOT Question

Based on the description can be seen that the level of knowledge and understanding of Physics teachers in preparing the problem of HOT can be categorized as not yet satisfactory. That is, many teachers of Physics SMAN Aceh lack the knowledge and understanding in preparing the HOT. The results of the analysis for Chemistry teachers showed that the level of knowledge of Chemistry teachers in preparing the HOT question was 10% in the very low category, 27% in the low category, 27% in the medium category, 30% in the high category and 7% in category very high. For the level of understanding, 17% of teachers are in the very low category, 30% in the low category, 17% in the medium category, 27% in the high category, and only 10% in the very high category. So there are as many as 37% of Chemistry teachers whose knowledge level is in the high and very high category, while for the level of understanding there are also 37%. For more details can be seen in Figure 4.

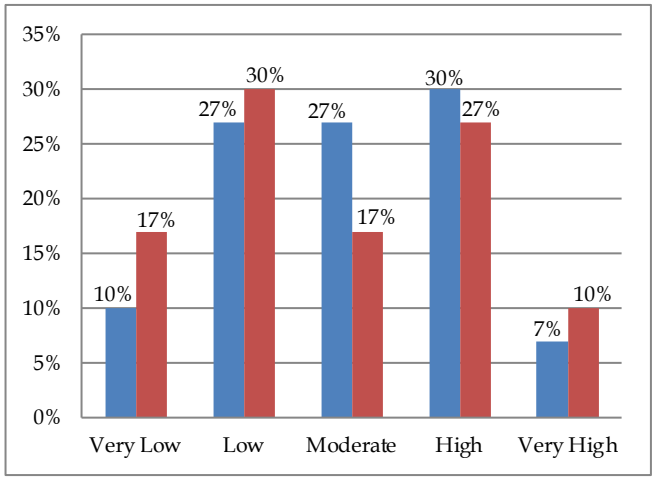

Figure 4. Knowledge Understanding Level of Chemistry Teacher's SMA in preparing the HOT question

Furthermore, for Biology teachers, the results of the analysis show that the level of knowledge of biology teachers in the preparation of HOT questions, as many as 13% of Biology teachers are in the very low category, 30% in the low category, 17% in the medium category, 27% in the high category, and 13 % in the very high category. For the level of understanding, there are 20% of Biology teachers have a very low understanding, 20% in the moderate category, 23% in the high category, and 13% in the very high category. See Figure 5.

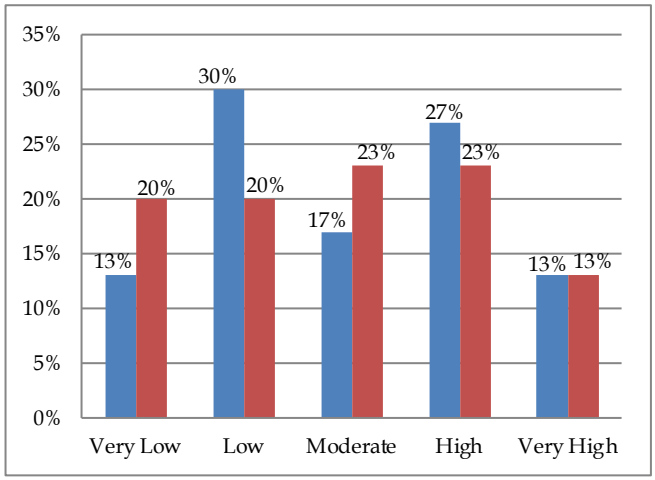

Figure 5. Knowledge and Understanding Level of Biology Teacher's SMAN In Preparing The HOT Question

For the level of understanding, as many as 20% of Biology teachers are still very low, 20% are low, 25% in the medium category, 25% in the high category, and 13% in the very high category, so there are 38% of Biology teachers who have a level of understanding about the preparation of the HOT question is in the high and very high category. If the level of knowledge of teachers who are categorized as high and very high is accumulated, then the number of teachers attained 38% of physics

categorized high and very high, Chemistry teachers is 37% and Biology teachers are 40%. Furthermore, if the level of understanding of teachers who are categorized as high and very high is accumulated, then the Physics teacher to be as much as 27% of categorized as high and very high, Chemistry teachers is 37%, and Biology teachers are 38%. Thus, it can be seen that the number of Biology teachers who have a level of knowledge and understanding of high and very high categories related to the preparation of HOT questions than the teacher of Physics and Chemistry. Furthermore, the level of knowledge of physics teachers who are categorized as high and very high relative to the level of knowledge of chemistry teachers, but for the level of understanding that is categorized as high and very high, the number of Chemistry teachers is more than Physics teachers.

Based on the above description can be explained that in general the level of knowledge and understanding of science teachers (Physics, Chemistry, and Biology) at Aceh State Senior High School in preparing the HOT question has not been satisfactory. The number of Physics teachers who have the knowledge and understanding level categorized as very low and low related to the preparation of the HOT each as much as 25% and 36%. For chemistry, lessons have still encountered the teachers whose level of knowledge and understanding is a very low and low category related to the preparation of HOT questions as much as 37% and 45% of people. Furthermore, for Biology lessons, there are still teachers whose level of knowledge and understanding is very low and the low category related to the preparation of HOT questions is at 42% and 38%.

In general, science teachers of SMAN have not yet or still lack the knowledge and understanding in constructing the question which can increase students' reasoning. This situation is in line with the results of Yusrizal et al, (2011) which show the components of students' learning outcomes from teachers of Physics, Chemistry, and Biology at Banda Aceh State Senior High School who have been certified are still low. Also, the results of Yusrizal et al, (2017) showed that the skills of physics teachers of SMAN Banda Aceh in preparing and analyzing the items have not been satisfactory. Munasco (2013) suggests that teacher quality factors (qualifications) are considered the most dominant and affect the learning outcomes.

If this situation continues, it certainly affects the quality of Aceh and National education. One of the elements to be improved is the role of professional teachers. According to Pramawati & Wardana (2016), professional teachers are teachers who can play a role in educating, teaching, guiding, directing, training, assessing, and evaluating learners using skills that meet certain quality standards.

HOT questioning aims to create learning that makes learners challenged to think and use their reasoning (Salirawati et al, 2017). To assess the ability of higher-order thinking must use new materials. One way that can be done is to use context-dependent set items (Istiyono et al, 2014). For meaningful knowledge to be constructed, teachers must train students to think critically in analyzing and solving a problem. Therefore, teachers should be able to compose not only the Lower Order Thinking questions but also the Higher Order Thinking Questions. Thus, to achieve higher-order thinking skills, students must be accustomed to solving problems that require thinking to analyze, judge, and create.

Low knowledge and understanding of teachers in preparing HOT questions for their students, will make the teacher is not capable to provide the problems of contextual substance, demanding reasoning and creativity in completing it. According to Ramos, at. al (2013) higher-order thinking includes skills such as creative and critical thinking, analysis, problem-solving, and visualization. These skills involve categorizing items, comparing and contrasting ideas and theories, and being able to write about and solve problems.

As it is known that the development of the student's mindset progressed that should be followed by the ability of teachers in making the question that can reveal high-level cognitive aspects, such as the items of application and reasoning. The form of the question that can uncover the cognitive level known as the HOT questions should be mastered by the teacher so that the students are familiar with the question that challenge the thought and reasoning. Thus, the ability of teachers in preparing the evaluation tool is very important and must get serious attention (Widodo, 2012). Teachers are required to have the basic skills needed as educators, mentors, and instructors, and these abilities are reflected in teacher competencies (Pardede, 2019).

Nurhayani et al, (2018) stated that one of the difficulties faced by teachers in developing students' higher-order thinking skills was the lack of ability to adjust the questions and operational verbs contained in the learning indicators.

There are several ways that professional teachers can do to improve students' high-order thinking skills in their classroom learning, for example, by training students in scientific reasoning. According to Abdullah et al, (2015) good scientific reasoning and systematic awakening will improve students' higher-order thinking skills. For science lessons consisting of Physics, Chemistry, and Biology following the characteristics of science students can be trained in scientific reasoning in several ways, for example through learning using inquiry strategy (Fitriyati & Munzil, 2016). But keep in mind that the success of science learning in schools cannot be separated from the planning of appropriate

learning strategies and learning tools used by teachers in the classroom.

The cause of low scientific reasoning is the science teaching done by the lecture method and teaching materials used in the form of Students' Work Sheets consisting of material summary and exercise questions so that it cannot train the students' scientific reasoning (Fitriyani et al., 2017). It can be seen that teachers who teach science in high school must be competent in the field and have a high commitment to the profession, as well as high performance. Maximum teacher performance is a dream for all schools, as well as for the SMAN in Aceh Province. According to Osnal et al, (2016). Professional teachers following the main tasks and functions are (1) Able to prepare the Implementation Plan of Learning. (2) Able to construct quality test results. (3) Skillfully present teaching materials in class and outside class, professional in evaluating learning outcomes.

Conclusion

Based on the results of this research data analysis can be concluded that the level of knowledge and understanding of science teachers of SMAN in Aceh in compiling higher order thinking questions are in the medium category and the level of knowledge and understanding in compiling the questions of HOT, Biology teacher get higher and highest category compared to the teacher of Physics and Chemistry. Based on the results of this study can be put forward several suggestions, namely to all science teachers (Physics, Chemistry, Biology) SMAN in Aceh should deepen the material and techniques of higher-order thinking, the dean of SMAN in Aceh needs to follow up on the weaknesses of its teachers in formulating higher order thinking questions, and to the Head of Aceh Provincial Education Office, it is necessary to conduct a workshop or regular training on the compilation of HOT questions to all science teachers of SMAN in Aceh.

References

Abdullah, A.H., Abidin, N.L.Z., & Ali, M. (2015). Analysis of Students' errors in solving Higher Order Thinking Skills (HOTS) problems for the topic of fraction. *Journal of Asian Social Science*, 11(21), 133– 142. https://doi.org/10.5539/ass.v11n21p133

Abosalem, Y. (2016). Assessment Techniques and Student's Higher-Order Thinking Skills. *International Journal of Secondary Education*, 4(1), 1-11. http://dx.doi.org/10.11648/j.ijsedu.20160401.11

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

Azwar, S. (2012). *Psychological Scale Compilation*, Yogyakarta: Pustaka Pelajar.

Camellia., & Chotimah, U. (2012). Kemampuan Guru Dalam Membuat Instrumen Penilaian Domain Afektif Pada Mata Pelajaran Pkn Di Smp Negeri Se-Kabupaten Ogan Ilir. *Journal Forum Sosial*, 5(2), 114-122. Retrieved from https://repository.unsri.ac.id/25279/

Carina. A, Sutrisno, & Mujiyono (2014). Domain Level and Quality of Questions Made by Private Vocational School Teachers. *Jurnal Teknologi dan Kejuruan*, 37(2), 145-152.

Effendi, R. (2017). Konsep Revisi Taksonomi Bloom Dan Implementasinya Pada Pelajaran Matematika SMP. *Jurnal Ilmiah Pendidikan Matematika.* 2(1). https://doi.org/10.26877/jipmat.v2i1.1483

Fitriyati. I, Hidayat. A & Munzil (2017). Pengembangan Perangkat Pembelajaran IPA untuk Meningkatkan Kemampuan Ilmiah dan Berpikir Tingkat Tinggi Siswa Sekolah Menengah Pertama. *Jurnal Pembelajaran Sains*, 1(1), 27-34. Retrieved from http://journal2.um.ac.id/index.php/jpsi/article/view/651

Gable, R.K. (1986). *Instrumen Development in Affective Domain*. Boston: Kluwer Nijhoff Publishing.

Gais. Z., & Afriansyah. E.A. (2017). Analisis Kemampuan Siswa dalam Menyelesaikan Soal High Order Thinking Ditinjau dari Kemampuan Awal Matematis Siswa. *Jurnal "Mosharafa"*, 6(2), 255-266. Retrieved from https://journal.institutpendidikan.ac.id/index.php/mosharafa/article/view/mv6n2_9

Gaytan, J., & McEwen, B. (2007). Effective Online Instructional and Assessment Strategies. *The American Journal of Distance Education*, 21 (3): 117-132. http://dx.doi.org/10.1080/08923640701341653

Heong, Y. M, Othman.W. B, Yunos. J.B.Md, Kiong.T.T. (2011). The Level of Marzano Higher Order Thinking Skills among Technical Education Students. *International Journal of Social Science and Humanity*, 1(2), 121- 125. http://dx.doi.org/10.7763/IJSSH.2011.V1.20

Hill, R.B (1997). The Design of an Instrument to Assess Problem Solving Activities in Technology Education. *Journal of Technology Education*. 9 (1), 31-46. Retrieved from https://scholar.lib.vt.edu/ejournals/JTE/v9n1/pdf/hill.pdf

Istiyono. E, Mardapi. D & Suparno (2014). Development of HighLevel Physics Thinking Ability Test (PysTHOTS) for High School Students. *Jurnal Penelitian dan Evaluasi Pendidikan* 18(1), 1-12. Retrieved from

https://journal.uny.ac.id/index.php/jpep/article/view/2120/1765

Kawuwung, F (2011). Profil Guru, Pemahaman Kooperatif NHT, dan Kemampuan Berpikir Tingkat Tinggi di SMP Kabupaten Minahasa Utara. *Jurnal El-hayah*, 1(4), 157-166. Retrieved from http://ejournal.uin-malang.ac.id/index.php/bio/article/view/1693

Lailly. N. R & Wisudawati. A. W (2015). Analisis Soal Tipe Higher Order Thinking Skills (HOTS) dalam Soal UN Kimia SMA Rayon B 2012/2013. *Jurnal Kaunia*, XI(1), 27-39. Retrieved from: https://ejournal.uin-suka.ac.id/saintek/kaunia/article/view/1079

Maskuri & Anwar , K. (2021). Kebijakan dan Strategi Peningkatan Kompetensi Guru Serta Relevansinya Terhadap Mutu Lulusan yang Islami. *Jurnal Studi Pendidikan dan Pedagogi Islam,* 5(2). 103-113. https://doi.org/10.35316/edupedia.v5i2.1177

Merta, I.W., Lestari, N., & Setiadi. (2019). Teknik Penyusunan Instrumen Higher Order Thinking Skills (HOTS) Bagi Guru-Guru SMP Rayon 7 Mataram. *Jurnal Pendidikan dan Pengabdian Masyarakat*, 2(1): 48-53. Retrieved from https://jurnalfkip.unram.ac.id/index.php/JPPM/article/view/1011

Munasco (2013). Formative Tests, Teacher Qualifications and Physics Learning Outcomes by Controlling Early Abilities. *Jurnal Evaluasi Pendidikan*, 4(1), 37 – 51.

Noor, S. (2020). Penggunaan Quizizz dalam Penilaian Pembelajaran pada Materi Ruang Lingkup Biologi untuk Meningkatkan Hasil Belajar Siswa Kelas X.6 SMA 7 Banjarmasin. *Jurnal Pendidikan Hayati*, 6(1): 1-7. https://doi.org/10.33654/jph.v1i1.927

Nurhayani, N., Syamsudduha, S., & Afiif, A. (2018). Kesulitan Guru dalam Pengembangan Keterampilan Berpikir Tingkat Tinggi Siswa dalam Pembelajaran Biologi Kelas XII di SMA Negeri 2 Gowa. *Jurnal Biotek*, *6*(1), 93-111. https://doi.org/10.24252/jb.v6i1.5153

Osnal, O., Suhartoni, S., & Wahyudi, I. (2016). Meningkatkan Kemampuan Guru Dalam Menyusun Tes Hasil Belajar Akhir Semester Melalui Workshop Di KKG Gugus 02 Kecamatan Sumbermalang Tahun 2014/2015. *Pancaran Pendidikan,* *5*(1), 67-82. Retrieved from https://jurnal.unej.ac.id/index.php/pancaran/article/view/2604

Pardede, L. (2019). Meningkatkan Kompetensi Guru dalam Menyusun Perencanaan Perencanaan Pembelajaran Melalui Bimbingan Berkelanjutan di SMA Negeri 17 Medan. *Jurnal Darma Agung*, XXVII(1): 854-862. Retrieved from: http://jurnal.darmaagung.ac.id/index.php/jurnaluda/article/view/141/162.

Pramawati. A.A.I.Y & Wardana. I.K. (2016). Pendekatan Penyusunan Soal Bagi Guru-guru Bahasa Inggris SMP Sekecamatan Mengwi. *Jurnal Bakti Saraswati*, 5(1). 49 -59.

Pujihastuti, I. (2010). Principles of Writing a Research Questionnaire. *Journal of Agribusiness and Regional Development*, 2(1), 43-56.

Putra, Z. F.S, Sholeh. M & Widyastuti. N. (2014). Analysis of the Quality of BTKP-DIY Webesite Services Using the Webqual 4.0 Method. *Jurnal JARKOM*, 1(2), 174-184. Retrieved from http://journal.akprind.ac.id/index.php/jarkom/article/view/358

Ramos. J. Lyn, B. B. Dolipas &, B. B. Villamor. (2019). Higher Order Thinking Skills and Academic Performance in Physics of College Students: A Regression Analysis. *International Journal of Innovative Interdisciplinary Research*, 4, 2013, 48-60. Retrieved from: https://www.researchgate.net/publication/333507142_Higher_Order_..._Analysis

Rofiah, E, Nonoh S. A, Elvin Y. E. (2013). Penyusunan Instrumen Tes Kemampuan Berpikir Tingkat Tinggi Fisika Pada Siswa SMP. *Jurnal Pendidikan Fisika*, 1(2). 17 – 22. Retrieved from: https://media.neliti.com/media/publications/120699-ID-none.pdf

Salirawati. D, Permanasari. R.L, Purtadi. S, Nugraheni.A.R.E,Dina (2017). Pelatihan dan Pengembangan Soal HOT (High Order Thinking) Sebagai Peningkatan Kompetensi Pedagogik Guru. *Jurnal Inoteks*, 21(1), 14-25. Retrieved from: https://journal.uny.ac.id/index.php/inotek/article/view/13175

Saragih, A. H. (2008). Kompetensi Minimal Seorang Guru dalam Mengajar. *Journal of Tabularasa PPs Unimed*, 5 (1), 23 – 34. Retrieved from: http://digilib.unimed.ac.id/715/1/...mengajar.pdf

Syahida. A & Irwandi.D. (2015). Analisis Keterampilan Berpikir Tingkat Tinggi Pada Ujian Nasional Kimia. *Jurnal EDUSAINS*, 7(1), 2015, 77-87. Retrieved from: https://journal.uinjkt.ac.id/index.php/edusains/article/view/1404/1625

Widodo, L. (2012). Upaya Meningkatkan Kompetensi Guru dalam Menyusun Tes Hasil Belajar Melalui Workshop Penilaian di SMPN 2 Panti Jember. *Jurnal JP3*, 2(2). 168 -179. Retrieved from: https://jurnaljp3.files.wordpress.com/2013/09/lulud.pdf

Widyastono, H. (2013). Minat Terhadap Profesi Guru, Pengetahuan Tentang Penilaian Hasil Belajar, Kualitas Kurikulum Buatan Guru. *Jurnal Pendidikan dan Kebudayaan*, 19 (2), 222-235. Retrieved from: https://jurnaldikbud.kemdikbud.go.id/index.php/jpnk/article/view/282

Winarsih. A., & Mulyani. S. (2012). Peningkatan Profesionalisme Guru IPA Melalui Lesson Study dalam Pengembangan Model Pembelajaran PBI. *Jurnal Pendidikan IPA Indonesia,* 1 (1), 43-50. https://doi.org/10.15294/jpii.v1i1.2012

Yusrizal, Soewarno & Fitri . Z. (2011). Evaluasi Kinerja Guru Fisika, Biologi, dan Kimia SMA Yang Sudah Lulus Sertifikasi. *Jurnal Penelitian dan Evaluasi Pendidikan*, 15(2), 269-286. Retrieved from https://journal.uny.ac.id/index.php/jpep/article/view/1097/1149