

## HOTS QUESTION PREPARATION TRAINING TO DEVELOP PEDAGOGIC SKILLS OF CHEMISTRY TEACHERS IN PALU CITY

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### Abstract

The ability to think highly abbreviated as HOTS is an ability applied in the revised 2013 Curriculum. Teachers are required to be able to make Higher Order Thinking Skills (HOTS)-oriented questions, which are questions whose questions can train students to think at a higher level at the level of analysis, evaluation, and creation. The provision of HOTS questions aims to create challenging learning for students to reflect and apply their reasoning. However, the reality in the field based on an interview with the head of the Palu City Chemistry MGMP, there are still many teachers who have not been able to make and compile HOTS questions, especially those who are members of the MGMP. Teachers who are members of the chemistry Subject Teacher Conference (MGMP) as partners of this service still experience problems in analyzing the forms of questions that can improve higher-order thinking skills (HOTS). To overcome this, training and mentoring with participatory models are carried out, which include: 1) analysis and interpretation of Bloom's taxonomy, 2) HOTS-based problem-making techniques, 3) characteristics and forms of HOTS questions, and analyzing question forms that can improve higher-order thinking skills (HOTS). The activity has been carried out well thanks to good cooperation with various parties. This is illustrated by the output in the form of HOTS questions that participants have made from the results of this training and service assistance. The final result of this service is according to the expected target, namely the existence of a book of HOTS questions produced which are used in chemistry learning.

**Keywords:** HOTS Questions, Chemistry Teacher, Higher Order Thinking

### INTRODUCTION

The Palu City Chemistry Subject Teacher Conference (MGMP) has a group of around 47 teachers. Its members come from 9 public high schools namely SMAN 1, SMAN 2, SMAN 3, SMAN 4, SMAN 5, SMAN 6, SMAN 7, SMAN 8, and SMAN 9 along with private high schools in the city of Palu namely SMA Muhammadiyah, SMA Karunadipa, SMA Catholic, SMA BK, SMA Berdikari, SMA Swadaya, SMA GKST, SMA Advent, and SMA Mamboro. The group of chemistry teachers scattered in the school less actively participated in MGMP. The percentage of attendance that follows MGMP is only about 35%.

The material discussed in MGMP is still limited to a) learning tools (preparation of lesson plans), and b) Increased understanding of class X material. Therefore, there are still many essential problems needed in schools that have not been revealed in MGMP which is no less important is the evaluation tool. In evaluation, the questions developed are questions that generally measure the ability in the realm of analyzing (C4), evaluating (C5), and creating (C6). HOTS questions will hone logic, critical thinking, and creativity

Therefore, teachers are required to be able to make Higher Order Thinking skills (HOTS)-oriented questions, which are questions whose questions can train students to think at a higher level at the level of analysis, evaluation, and creation (Wahyuningtyas, et al, 2018). The provision of HOTS questions aims to create challenging learning for students to reflect and apply their reasoning (Sofyan, 2019; Lestari et al, 2016). In conducting evaluations, especially evaluations on cognitive aspects, a teacher is required to be able to develop various appropriate evaluation instruments and be able to demonstrate students' abilities comprehensively (Kristanto, 2020). The development of students' thinking should be followed by the development of teachers in compiling questions that are at the level of application and reasoning (Sofyan, 2019). HOTS questions should be used so that students are familiar with questions that challenge their thinking skills.

However, the reality in the field based on an interview with the head of the Palu city chemistry MGMP, Mrs. Rohmala Enar, there are still many teachers who have not been able to make and compile HOTS questions, especially those who are members of the MGMP. The quality of the questions used at test time or exams is almost always the same. This can be caused by teachers who tend to use questions from supporting books which are dominated by questions at the Low Order Thinking Skills (LOTS) level, namely remembering, understanding, and applying (Ayuningtyas, et al, 2013), teachers do not understand how to make and develop HOTS questions, training related to the development of HOTS questions is still minimal, and teachers do not see the importance of HOTS questions for students.

Based on the description that has been presented, it can be concluded that the ability of teachers, especially those who are members of the MGMP of Palu City, in compiling HOTS questions still needs to be improved. Therefore, to help teachers improve their understanding of the concept and preparation of HOTS questions, it is necessary to hold training for teachers in the form of training in the preparation of HOTS questions. The service team from the Chemistry Education Study Program FKIP Tadulako University was moved to carry out a community service activity, entitled "Training on HOTS Question Preparation to Develop the Pedagogic Ability of Chemistry Teachers in the City of Palu". This Community Service activity aims to provide an understanding of the characteristics and ways of developing quality HOTS (Higher Order Thinking Skills) questions and, provide direct experience in turning ordinary questions into HOTS questions.

Based on the analysis of the situation, the justification of the problems faced by teachers who are members of the Palu City Chemistry MGMP in terms of priority scale is as follows: Do not understand: 1). HOTS (Higher Order Thinking Skills) problem preparation and development techniques. 2). The technique of turning ordinary questions into HOTS questions. Provide an understanding of the characteristics and ways of developing quality HOTS (Higher Order Thinking Skills) questions and, provide direct experience in turning ordinary questions into HOTS questions.

Therefore, the service team felt called to carry out a community service activity, entitled "Training on Hot Question Preparation to Develop the Pedagogic Ability of Chemistry Teachers in Palu City"

## **METHOD**

### ***Method of approach***

The approach methods offered to solve partner problems are: 1). The presentation of the material is related to the form, characteristics, examples, and how to compile HOTS-based questions, 2). Discussion and Q&A related to the material form, characteristics, examples, and how to compile HOTS-based questions, 3). Provision of training and practice in preparing HOTS-based questions, making ISBN question bank books that can be used by partners in their respective schools, 4. Conduct assistance to ensure that the material presented to partners can be implemented properly so that the results obtained can achieve the target, namely partner teachers can make HOTS-based questions.

### ***Implementation of Activities***

The service program for chemical MGMP partners in the city of Palu was carried out at SMAN 4 Palu. The service activities carried out are:

1. Socialization with the school and the Department
2. Explanation to participants about the importance of forms, characteristics, examples, and how to compile HOTS-based questions, train and practice directly, and provide direct experience in compiling high-level creative thinking problems and additional knowledge information to Partner Groups.
3. Practical work on making/preparing HOTS questions for class X-XII materials, which is carried out directly by teachers who are members of the Palu City chemistry MGMP accompanied by the service implementation team

## **PKM IMPLEMENTATION RESULTS**

### ***Training implementation***

The implementation of the service began with socialization with related agencies, MGMP Kimia Kota Palu. This socialization aims to provide information to relevant agencies regarding service so that participants know the purpose of implementing the program by the implementation team so that there is no misinformation. Furthermore, after the submission of a comprehensive program plan, it continued with the provision of training related to the theme of service, namely Training on the Preparation of Hots questions to Develop the Pedagogic Ability of Chemistry Teachers in Palu City

The training was held at SMAN 4 Palu. In the implementation of the training, the participants involved were members of the Chemical MGMP of the city of Palu. The number of participants who participated in this training was 30 people.

Training materials include Forms, characteristics, examples of higher-order thinking skills (HOTS) problems, HOTS-based question preparation techniques, HOTS-based Question

Making Practices for grade 10 to 12 chemistry materials, and assistance in solving these chemical problems.



**Figure 1 Implementation of HOTS Question-Making Training**

The training materials are described as follows:

1). Understanding Higher Order Thinking Skills (HOTS)

Higher order thinking skills (HOTS) include higher-order thinking skills (HOT). Sani (2019) suggests that higher-order thinking skills include critical, logical, reflective, metacognitive, and creative thinking skills. These critical thinking skills are necessary in solving problems and making decisions. HOTS will thrive if the individual faces an unfamiliar problem, challenging question, or faces uncertainty/dilemma.

The learning paradigm should shift from conventional learning that emphasizes low-level thinking skills to learning higher-order thinking skills, especially critical thinking is the basis that students must have to be able to develop higher-order thinking (Rahma, 2012).

HOTS itself is part of the cognitive realm in Bloom's Taxonomy and aims to hone mental skills around knowledge. Bloom's version of the cognitive realm was revised to six, namely: (1) remembering; (2) understanding; (3) applying; (4) analyzing (analyzing); (5) evaluating; and creating, (Darmawan et al, 2013). Levels 1 to 3 are categorized as low-order thinking skills

(LOTS), while levels 4 to 6 are categorized as higher-order thinking skills (HOTS). In this dedication, question training leads to HOTS.

2). The forms of Higher Order Thinking Skills (HOTS) questions include:

*a. Questions to assess critical thinking skills*

For example: Part 1 of the Intervention test, contains: Instructions, Questions, and Conclusion Statements. Next, fill in the answers in the table provided and include the reason. Section 2: Assumption Acceptance Test, which contains: instructions, questions, and assumptions posed. Next, fill in the table of accepted assumptions with assumptions that are not accepted along with the reasons for each assumption.

How to test critical thinking skills, can also be done by making a list of several statements and asking the test taker to choose the type of statement. In addition, you can also use essay questions and questions that use a rating scale (multiple rating). Examples are 1) Questions to see the responses made by test takers 2) Comprehensive questions based on data 3) Explaining questions based on data 4) Prediction questions based on data

*b. Questions to assess creative thinking skills*

The most commonly used creative thinking problem in research and learning is the Torrance test. This test can take the form of image creation or sentence description. The term creative means that learning is a process of developing student creativity because basically every individual has imagination and curiosity that never stops according to experts creativity is a person's ability to give birth to something new or a combination of things that already exist to seem new (Ngalimun, 2013).

The ability to think creatively is a thought process to express new relationships, see things from a new perspective, and form new combinations of two or more concepts that have been mastered before (Putra et al, 2016). Thus, the ability to think creatively can bring up new ideas for students.

***Practical Work on Preparing Teaching Materials***

At this stage, participants were divided into 3 groups, namely: class X material group, class XI material group, and class XII material, with each group accompanied by a service implementation team and field personnel. Activities carried out in practical work are that participants are guided/accompanied starting from identifying the material to be made HOTS questions, so that the desired learning objectives can be achieved, to the preparation of HOTS questions.

*Compiling HOTS Questions*

*a. Critical Thinking Problems*

The learning process that can improve students' critical thinking skills is student-centered learning and takes place in a social context (Widyanto et al, 2022). One of the basic skills in critical thinking that is also related to problem-solving is to find alternative solutions by mapping the network of problems using mind maps or other graphic organizers. Mind mapping can be used to analyze the causes (roots) of problems. Solutions to problems can be sought by proposing alternative solutions and their impacts, and then choosing the most effective and efficient solution. (Sani, 2019).

Examples of critical thinking problems: (1) recognize problems; (2) define the problem; (3) explain meaning by careful observation; (3) find alternative solutions by mind mapping; (4) finding alternative solutions by cause and impact analysis; (5) deductive thinking; (6) inductive thinking; and (7) distinguish arguments and explanations.

b. Soal Problem Solving

Problem-based teaching is a very effective approach to teaching higher-order thought processes, helping students process the information they already have, and build their knowledge about the social and physical world around them (Nisrokha, 2018). A person's success in solving problems can be seen by the ability to combine logical thoughts and creativity abilities (Sucipto, 2017).

Teachers who are members of the chemistry MGMP make problems that have characteristics (Table 1) according to the needs of problem-solving, both for PBL and for other learning models or strategies.

**Table 1 Question Characteristics**

<b>Characteristics</b>	<b>Information</b>
Provides motivation	Engage students mentally
Is a real situation	Invite students to visualize the situation according to real conditions (authentic)
Does not provide images	Train students to create visualizations
Using the word "you"	Bring students in person
Requires decision billing	Train students to make decisions

4. Question Study

The questions that have been prepared by the partners of MGMP Kimia Kota Palu are then examined to see the conformity with the rules of preparing the questions. The study can be done by peers cross-wise in one subject family. Through question study activities, it is hoped that it will produce good questions, from the aspects of material, construction, and language (Kunandar, 2013).

All of these activities are carried out in such a way as to make it easier for trainees to do this on an ongoing basis.



**Figure 2 Practice of making HOTSg questions, accompanied by the Service Team**

### ***Mentoring***

Mentoring activities are carried out to ensure that the material/technology delivered to partners can be implemented properly so that the results obtained can achieve the target.



**Photo with teachers who are members of the Palu City Chemistry MGMP**

The output that has been achieved is the HOTS matter of class X, XI, and XII Chemistry materials from MGMP Kimia partners in the city of Palu.

## **CONCLUSION**

Service activities for partners of the Chemistry Teacher Deliberation (MGMP) in the city of Palu in the preparation of HOTS questions have been carried out well thanks to good cooperation with various parties. This is illustrated by the output in the form of HOTS questions that participants have made from the results of this training and service assistance.

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## **REFERENCES**

- Ayuningtyas, N. (2013). Proses penyelesaian soal higher order thinking materi aljabar siswa SMP ditinjau berdasarkan kemampuan matematika siswa. *MATHEdunesa*, 2(2).
- Darmawan, I. P. A., & Sujoko, E. (2013). Revisi taksonomi pembelajaran benyamin s. bloom. *Satya Widya*, 29(1), 30-39.
- Kristanto, P. D., & Setiawan, P. G. F. (2020). Pengembangan Soal HOTS (Higher Order Thinking Skills) Terkait Dengan Konteks Pedesaan. *PRISMA*, Prosiding Seminar Nasional Matematika, 3, 370–376.
- Kunandar. (2013). *Penilaian autentik (Penilaian hasil belajar peserta didik berdasarkan kurikulum 2013) suatu pendekatan praktis*. Jakarta: Raja Grafindo Persada.
- Lestari, A., Saepulrohman, A., & Hamdu, G. (2016). Pengembangan soal tes berbasis hots pada model pembelajaran latihan penelitian di sekolah dasar. *PEDADIDAKTIKA: Jurnal Ilmiah Pendidikan Guru Sekolah Dasar*, 3(1), 74–83.
- Ngalimun, dkk. (2013). *Strategi dan Model Pembelajaran Berbasis PAIKEM*. Banjarmasin: Pustaka Banua.



- Nisrokha, N. (2018). Pemanfaatan Web dalam Model Problem Based Learning. *Madaniyah*, 8(1), 1-26.
- Putra, R. D., Rinanto, Y., Dwiastuti, S., & Irfa'i, I. (2016). Peningkatan kemampuan berpikir kreatif siswa melalui model pembelajaran inkuiri terbimbing pada siswa kelas XI MIA 1 SMA Negeri Colomadu Karanganyar tahun pelajaran 2015/2016. In *Proceeding Biology Education Conference: Biology, Science, Environmental, and Learning* (Vol. 13, No. 1, pp. 330-334).
- Rahma, Alifa dan Noora, (2012). Pengembangan Perangkat Pembelajaran Model inkuiri berpendekatan sets materi kelarutan dan hasil kali kelarutan untuk menumbuhkan keterampilan berpikir kritis dan empati siswa terhadap lingkungan. *Jurnal of educational Research and evaluation*. 1(2)
- Sani, Ridwan Abdullah. (2019). Pembelajaran berbasis HOTS (higher order thinking skills). Tangerang: Tira Smart.
- Sofyan, F. A. (2019). Implementasi HOTS pada kurikulum 2013. *INVENTA: Jurnal Pendidikan Guru Sekolah Dasar*, 3(1), 1–9.
- Sucipto, S. (2017). Pengembangan ketrampilan berpikir tingkat tinggi dengan menggunakan strategi metakognitif model pembelajaran problem based learning. *JP (Jurnal Pendidikan): Teori dan Praktik*, 2(1), 77-85
- Wahyuningtyas, N., & Ratnawati, N. (2018). Workshop Pengembangan Soal Higher Order Thinking Skill (HOTS) Bagi Guru-Guru MGMP IPS Kabupaten Malang Pelatihan Penyusunan. *Jurnal Praksis dan Dedikasi Sosial (JPDS)*, 73–79.
- Widyanto, I. P., & Vienlencia, R. (2022). Peningkatan Kemampuan Berpikir Kritis dan Hasil Belajar Peserta Didik menggunakan Student Centered Learning. *Jurnal Pendidikan: Teori, Penelitian, dan Pengembangan*, 7(4), 149-157.