

Problem HOTS evaluation category of high school levels

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Abstract. The purpose of this study is the development of a mathematical problem High Order Thinking (HOT) evaluation type. By using the design research method type of development studies (development research). The research process is preliminary and formative evaluation consisting of self evaluation, expert reviews, one-to-one, small groups and field tests. The process of collecting data using document techniques, walkthroughs, tests, interviews and observations. The results of the data can then be analyzed descriptively. This research produces valid and practical questions and potential effects. For the validity of the questions can be seen from the results of the walkthrough with the expert, the process of expert review to students through one to one. The practicality of the questions can be seen from the use made by the teacher and students do not experience difficulties. The potential effects of the questions can be seen in the process of small groups and field tests to see students' mathematical literacy.

Keywords: HOTS, HOTS Problem evaluation category

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1. Preliminary

In the process of education in the 21st century now, that mathematics learning and curriculum demands will focus on the ability of HOTS (higher order thinking skills), namely analysis, evaluation and creating. Changes and updates made in the world of education from various aspects are needed in an effort to increase quality human resources and have high potential to improve Indonesia's PISA scores which are quite far behind those of countries, especially neighboring countries. As for what needs to be done in the world of education is to know and recognize in advance all of the abilities possessed by students in a holistic way or with a variety of disciplines. The ability to think that is relatively low may be due to various factors experienced by students, including the lack of teachers in providing questions that can require students to be trained to do analysis, evaluation and create so that it can affect students' ability to think at a higher level is still lacking. This is due to the fact that mathematics learning is still focused on improving the ability to memorize and use concepts in general, whereas to train in developing high-level thinking skills is still lacking. characteristics of mathematics learning at this time are more focused on procedural skills, one-way communication, monotonous classroom settings, low order thinking skills, relying on textbooks, more dominant routine questions and low-level questions [1]. The process by the teacher is still procedural in providing learning, especially in mathematics by prioritizing easier ways to solve practice questions [2].

In this case, that teachers are asked to play an active role in making changes and updates in the world of education today, so that efforts to improve Indonesia's PISA scores are far behind so that they can increase. Then the need for a change made in learning in order to be able to train and improve students' high-level thinking skills in the classroom. Good learning is learning that familiarizes problem-based learning, invites students to always explain and maintain the process and results of their work from criticism made by their peers, accustom students to solve problems with a variety of

strategies (open ended approach) and invites them to evaluate strategies it is reviewed in terms of its effectiveness and efficiency as well as carrying out reflective practices (by keeping learning journals) [1].

HOTS (higher order thinking skills) is now the main focus of mathematics learning goals and is a curriculum demand. The ability of students in higher order thinking (higher order thinking skills) namely the ability to analyze / C-4, assess / C-5 and create / C-6) [3]. Bloom's taxonomy is the basis for higher-order thinking. Indicators that are used as a tool in measuring the ability to think at a higher level are analysis, evaluation, and creating [4]

High Order Thinking Skills (HOTS) include the ability of logic and reasoning (logic and reasoning), analysis (analysis), evaluation (evaluation), and creation (creation), problem solving (problem solving), and decision making (judgment) [5]. Likewise Minister of Education and Culture Regulation Number 21 of 2016 concerning Education Content Standards which explains the problem of competence, namely attitudes, knowledge and skills while Minister of Education and Culture Regulation Number 22 of 2016 and Basic and Secondary Process Standards also explains the problem of the learning process in education units as interactive, inspiring, fun, active participation in motivating students, independence.

Categories in the Higher Order Thinking Skills are at the Analyze, Evaluate and Create levels [6]. Low thinking ability is the ability to remember, understand and apply, while the ability to think high is to analyze, evaluate and create [7]. Higher-order thinking ability is defined as the wider use of the mind to find new challenges that are often used by students in accordance with the facts and the process of solving problems that are precise and more effective, the information explored by students will be the basis for the structure and its relation. This ability to think at a higher level requires someone to apply new information or prior knowledge and manipulate information to reach possible answers in new situations [8]. The process of thinking is not limited to memorization or the information obtained is directly conveyed again [9].

To see someone who has the ability to Higher Order Thinking Skills, it takes several indicators that are used as a measure to measure the level of ability someone has. Indicators in the process of measuring the ability to think at a high level at C5 level or evaluation include providing an assessment of solutions, ideas and methodologies using suitable criteria or existing standards to ascertain the value of effectiveness or benefits, make hypotheses, criticize and test, accept or reject a statement based on established criteria [10].

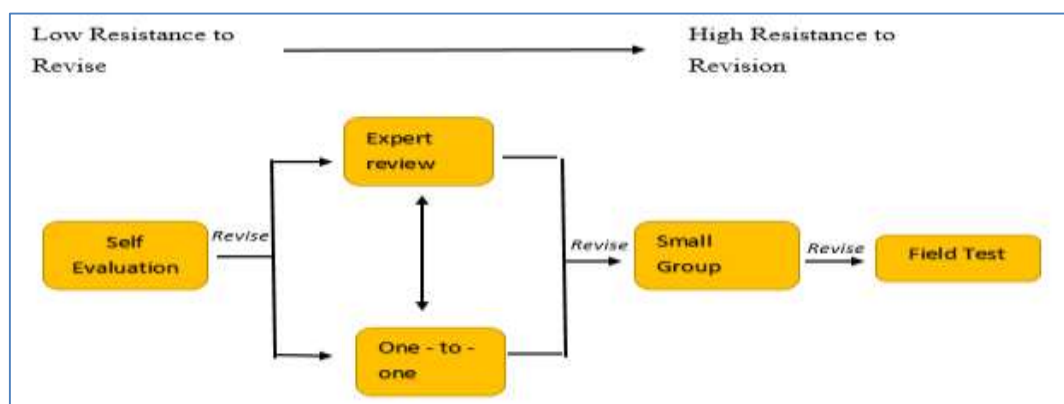
Priorities prioritized in the existing mathematics learning process include high thinking ability and good level of skills [11]. The process that is needed in developing Higher Level Thinking Skills is the ability of the teacher to have good planning and management of teaching and learning processes to students both from the ability to think logically, effectively and efficiently students and attitudes and skills [12].

All of the above explanations that the 2013 curriculum is currently required of how students have a good attitude and knowledge as well as skills in processing, serving, reasoning creatively, critically, productively, collaboratively, communicatively, independently in the realm of concrete and abstract domains in accordance with the arrangement of learning that is observing, ask questions, try, reason, serve and create.

Of all the explanations from the background above. That the researcher was motivated in developing the HOTS Evaluation questions for the High School Level valid and practical to see the potential effects of the questions on high school mathematics literacy.

2.Method

Design research is a type of development studies as the method used in this study. The aim is to produce questions that are characterized by HOTS valid and practical evaluation types and potential effects. The research process is preliminary and formative evaluation, formative evaluation flow in accordance with the picture below.



Picture. 1 formative evaluation design flow [13].

The process of conducting research in the odd semester 2018/2019. Class XII students of SMA Negeri 1 as research subjects with 33 participants.

The process of documents, walkthroughs, documentation, tests and interviews is a technique carried out by researchers to collect and analyze research data. The researcher documents the data collection process of the validator and students. The data forms are compounded by comments and suggestions or sheets by students, videos and records of the research process. The documentation starts from the one-to-one stage, small groups, and finally the field test. While walkthrough, researchers do it at the time of validation with expert review to obtain input or suggestions as comments to see the level of validity of the prototype developed by researchers.

Furthermore, researchers conducted tests to students with the aim of knowing the ability of students' mathematical literacy of the prototype questions that have been produced by researchers. Then the data from the results of student tests will be analyzed in accordance with the steps taken, namely making the answer to the question used as the key and scoring from the answer to the questions, the answers to the questions that were tested with students will be checked based on the key that has been determined, giving a score in the student answer process which exists. Then in the process of one to one, small groups and field tests will be conducted interviews with students to obtain information and ask questions in outline only about the questions tested.

While the process of one to one, small groups and field tests that take place, researchers then make observations to see what is done by students. The results of observations made by researchers in each process carried out ranging from one to one and small groups to field tests are all analyzed in a descriptive manner, aiming that researchers can see the questions and answers of students who worked on when experiencing difficulties in the completion process, whose function as a guideline for revising each prototype developed by researchers. When observing the field test phase that researchers acknowledge, the aim is to look directly at students how the mathematical literacy ability of the prototype results developed by researchers. All results from documentation, walkthroughs with experts / experts and the process of interviews with students will continue to be analyzed by researchers in a descriptive manner.

3.Results and Discussion

The Evalausi type of Higher Order Thinking Skills (HOTS) produced by researchers in their research is valid, practical and the potential effects of students in seeing their mathematical literacy abilities in high school level geometry material. The research process is carried out using stages, starting from the preliminary stage and then proceed with the formative evaluation stages which include various stages, namely, self evaluation, expert reviews, one-to-one, small groups - up to the field tests conducted by researchers .

For the preliminary stage carried out by the researcher, first how to determine the research subject, the place used as the location of the research carried out later. After the researchers begin to review the literature used in the research process and relate to the research conducted. The researcher will also analyze the material used, so that the basic competencies and core competencies in the geometry material will be related to the matter of the Higher Order Thinking Skills (HOTS) Evaluation type at the high school level which will be designed by researchers and the use of the 2013 revised 2017 curriculum. analysis of all related to the implementation of research, then researchers design the Higher Order Thinking Skills (HOTS) evaluation type at the high school level, the scoring rubric, the questions grid and the question cards that will be used as guidelines in the assessment of student answers and determine the validator as a validation of the questions that provide comments and suggestions about questions designed by researchers.

In the Self Evaluation stage, the researcher conducted the evaluation of the Higher Order Thinking Skills (HOTS) type of evaluation at the high school level that was designed, the scoring rubric, the question grid and the question card. By looking at both in terms of content, construct, and language used by researchers in carrying out research later. In its implementation, researchers will be assisted by colleagues or subject teachers from SMA N 1 Palembang, who teach mathematics in class XII in evaluating all instruments used by researchers to carry out research. From the evaluation produced with colleagues or subject teachers in the self-evaluation phase this is used as a prototype 1 in accordance with the questions and picture 2.



<https://www.google.com/search?client=firefox=gambar+bangunan+masjid+chengho+Palembang>

Figure 2. Problem prototype process 1

The Chengho Mosque is located in "Palembang" building built in 2003, the first phase of construction cost 150 million Rupiah as a result of community contributions, the roof of the building is shaped like a square pyramid. the long side of the building's base is 6 m, its ribs are 5 meters. what is the distance between the height of the roof and the roof of the building.

The expert review stage conducted by the researcher is carried out jointly with the one-to-one stage. In the expert review stage, the experts will validate the question instrument that has become prototype 1 by reviewing the content, constructs, and language used by the researcher. The expert reviews / expert lecturers who are validators of question instruments, are well-known lecturers at the PGRI University of Palembang who conduct reviews and suggestions and input provided to researchers as input about Higher Order Thinking Skills (HOTS) types of evaluation at high school level related to content , constructs and language used by researchers. From suggestions and input from expert reviews / expert lecturers will be the basis for researchers to improve the quality of questions designed by researchers.

Table 1. Results of validation with an expert

expert	Comments, suggestions / suggestions for revision
Expert 1	The image is replaced with the original image Use of letters in city names is noted
Expert 2	The semicolon is corrected The use of the sentence in the problem is corrected Try not to use images from online sources.

After the expert review has been carried out, the researchers immediately tried out the questions that became Protipe 1 to students in the one to one stage to 3 students with high, medium and low abilities. The questions tested in this one-to-one process are the Higher Order Thinking Skills (HOTS) type of evaluation at the high school level with the aim of the researcher being able to obtain information about how the clarity of the questions and pictures the researcher uses in the questions, the readability of the questions, the purpose and objectives of the questions and pictures , and researchers can find out the level of difficulty of students in solving problems used. So in this one to one stage the researcher gets information and suggestions from students directly to be used as revision material for the questions that were designed or the questions that have been used as prototype 1.

Table. 2 Student comments one-to-one process

Komentarsiswa		
Student1	Student 2	Student 3
<ul style="list-style-type: none"> ➤ The picture is clear ➤ The word 'resplang' is replaced with the base of the roof 	<ul style="list-style-type: none"> ➤ The images are clear and helpful ➤ The word 'resplang' is replaced with the base of the roof 	<ul style="list-style-type: none"> ➤ The word 'resplang' is replaced with the base of the roof

When the expert review and one-to-one stages have been completed, the researcher will revise prototype 1 again as information obtained by researchers both comet, suggestions and input from experts and students in both processes. Comments, suggestions and input obtained by researchers as a basis for making revisions so that the results of the revision will be an instrument of the latest questions with other terms namely prototype 2, contained in questions and figure 3 below.



Gambar 3. Soalprototipe 2.

The Chengho Mosque is located in Jakabaring, Palembang, built in 2003. The first phase of construction cost 150 million rupiah from community contributions. The roof of the building is in the

shape of a square pyramid. the long side of the building's base is 6 meters, its ribs are 5 meters. What is the distance between the height of the roof and the base of the roof.

The Higher Order Thinking Skills (HOTS) type of evaluation at the high school level, which the researchers made as prototype 2, was declared valid. Because the researcher revised the question instrument, based on what was the comments and suggestions as well as input from experts / experts and students in the one to one process undertaken by researchers and students. The results of the revision will be adjusted based on the content, constructs and language in the questions and images that have been used by researchers.

When the expert review and one-to-one process is completed, the researcher will continue the matter of Higher Order Thinking Skills (HOTS) Evaluation type at the high school level to be tested back to the small group stage. In this small group process, researchers need students as subjects as many as 6 people, which will help run the small group process, then researchers will divide from 6 students into two groups, each with 3 members, with high, medium and low abilities.

The process of small groups conducted by researchers aims to see a weakness or strength as well as the level of effectiveness of a question instrument used as a prototype 2. After the small group process takes place, the researcher can see that every student who is working on Higher Order Thinking Skills (HOTS) This type of evaluation at the high school level does not really indicate that they are experiencing difficulties, the main focus seen by researchers is how students understand the use of language and the goals contained in the problem, the images used can also be understood and seen clearly by students. After the results of the researchers' observations during the small group take place and the questions asked by the researchers during interviews with students after completing the questions, in order to obtain more detailed information so that they can support the results of the observations, the researcher can state that the revised prototype 2 can be declared already valid and practical. In accordance with the results of the students' answers in

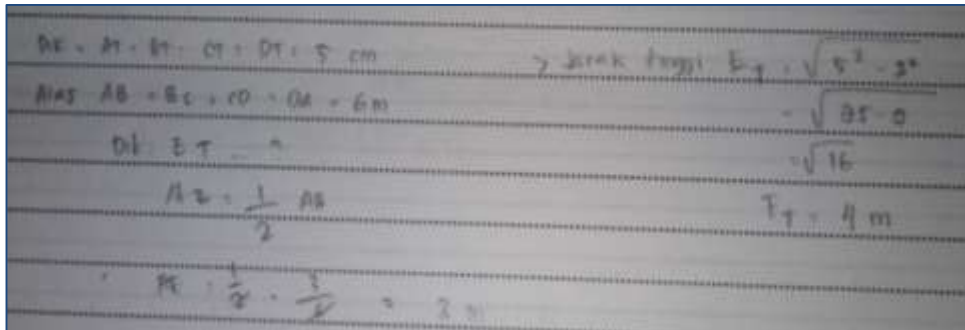
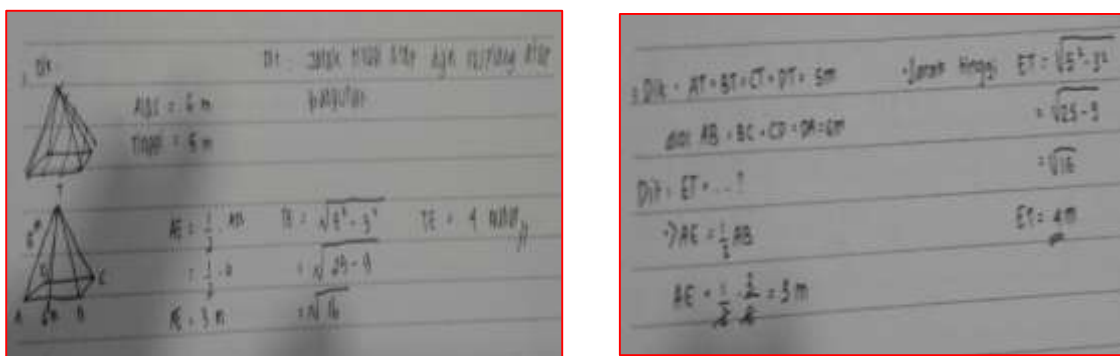


Figure 4 they worked on the small group process.

In the picture. 4 that students can show their ability to answer questions that are good and right, by reading and understanding the purpose and purpose of the questions and pictures used, then students write answers on the answer sheets provided by researchers. While in the interview process conducted by researchers with small group students as other representatives, provide information to researchers that the questions given or tested on them have been clear and understood the purpose and objectives of the questions and pictures used, according to the results of the research interview with the student , then the researcher gives a conclusion to the instrument the problem or prototype 2 will be maintained by the researcher and does not need to revise again. From the results of the small gorup that has been done, the instrument used as prototype 2 becomes a question instrument as prototype 3, which will be continued by researchers into the next field test stage.

4. Discussion

In the process of student answers that are done according to the picture shown by the researcher below:



Picture. 5 answers from D.R.R and M.E.A

The strategies used by students answering questions are seen on the DRR and MEA answer sheets. They demonstrate the ability to define problems and provide an assessment of solutions and ideas in making hypotheses or tests conducted on HOTS type evaluation questions (C5) and the images used in relation to point spacing with a line in his daily life. They can also accept or reject a statement based on predetermined criteria

The process of working on the problems that students do, by understanding and paying close attention to the questions and the images displayed on the problems given by researchers to them. Then students will write elements of the information contained in the problem such as the length of the roof base and roof height of the mosque building into their answers, make suitable ideas to ascertain its effectiveness, make hypotheses, accept statements based on criteria and then formulate questions on the questions.

From the results of the field test conducted by researchers to students as the object. That there are 27 students out of 33 students who are able to evaluate and define questions and pictures presented by researchers in the process of conducting field tests. In this process the researcher can see what students have raised on the problem being worked on, among others, the ability to provide an assessment of solutions, ideas and methodologies that fit the criteria that are suitable, make hypotheses, criticize and test, accept and reject statements based on criteria statute.

5. Conclusions

The researcher concludes from the results of the discussion carried out including:

1. This research has produced a valid and practical type of High Order Thinking (HOT) Problem that has potential effects. To prove that the questions that have been designed by the researcher are valid, both in content, construct and language used by the researcher in the matter, namely from the results of the validator's assessment in the expert review process and one to one. While the process of students' ability to do the problems well without experiencing difficulties can be seen from the observations and small group interviews.
2. Based on the results of the analysis of researchers, that the mathematical literacy ability seen in students has been good, in the process of working on questions students have been able to bring up their abilities by evaluating and defining questions and pictures first then giving an assessment of solutions, ideas and methodologies in accordance with the criteria that is suitable, makes a hypothesis, criticizes and tests, accepts and rejects a statement based on the criteria for determination.

Suggestions given by researchers are:

1. For educators, the results of research conducted by this researcher, for you, are used as a treasury about the High Order Thinking (HOT) type of evaluation in schools.
2. For further researchers, the results of this study can be used as a new reference for conducting further research to develop the High Order Thinking (HOT) evaluation type.

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