

Higher-Order Thinking Skill Oriented Learning: Are Teachers and Students Ready?

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Abstrak. Keterampilan berpikir tingkat tinggi merupakan salah satu kemampuan penting yang dimiliki oleh setiap individu. Salah satu upaya untuk meningkatkan kemampuan ini adalah dengan mengajarkannya di sekolah. Penelitian ini merupakan penelitian fenomenologis yang bertujuan menggambarkan sejauh mana kesiapan guru dan siswa dalam menerapkan pembelajaran berorientasi pada keterampilan berpikir tingkat tinggi. Penelitian ini melibatkan 16 responden guru matematika dari 16 sekolah berbeda di 12 kota berbeda di Indonesia. Data dalam penelitian ini diperoleh melalui distribusi formulir google dengan pernyataan terbuka ke sejumlah guru matematika. Teknik analisis dalam penelitian ini menggunakan analisis tematik dengan mengumpulkan informasi dari responden menjadi beberapa poin utama. Hasil penelitian menunjukkan bahwa ada beberapa hal yang harus diperhatikan untuk meningkatkan kesiapan guru dan siswa dalam menerapkan pembelajaran berorientasi keterampilan berpikir tingkat tinggi. Beberapa hal tersebut diantaranya: 1) kesadaran guru, 2) kemampuan guru tentang keterampilan berpikir tingkat tinggi, 3) penggunaan model / metode pembelajaran, 4) penyajian pertanyaan, 5) konsep pertanyaan keterampilan berpikir tingkat tinggi, 6) konsep pemahaman siswa, 7) kemampuan siswa tentang keterampilan berpikir tingkat tinggi, 8) minat siswa, 9) alokasi waktu, dan 10) sumber belajar.

Kata kunci: faktor lain, guru, kemampuan berpikir tingkat tinggi, siswa.

Abstract. Higher-Order Thinking Skill is an important ability possessed by every individual. One effort to improve this ability is to teach it in school. This phenomenological research aims to describe the extent of teachers and students' readiness to apply higher-order thinking skill-oriented learning. This study included 16 mathematics teacher respondents from 16 different schools in 12 different cities in Indonesia. The data in this study were obtained by distributing google form links using open questions to several mathematics teachers. The analysis technique in this study uses thematic analysis by gathering information from respondents into several main points. The results showed that several things must be considered to improve the readiness of teachers and students in implementing higher order thinking skill oriented learning. Some of these things include: 1) teacher awareness, 2) teacher ability about higher order thinking skill, 3) use of learning models/methods, 4) presentation of questions, 5) higher

order thinking skill question concepts, 6) concepts of student understanding, 7) students' abilities about higher order thinking skill, 8) student interest, 9) time allocation, and 10) learning resources.

Keywords: higher order thinking skill, others fact, teacher, student.

Introduction

Mathematics is one of the subjects in the education curriculum which plays an important role in life. Many things are factors of success in learning mathematics and one of them is the teacher. Professional teachers are competent in building and developing good and effective learning processes to produce intelligent students and quality education (PG Dikdas, [2020](#)). This makes the quality of learning a component that is the focus of attention of the central government and local governments in improving the quality of education, especially regarding the quality of graduate students.

Higher Order Thinking Skill (HOTS) is one of the important abilities possessed by every student. HOTS can be trained through mathematics learning (Misykah & Adiansha, [2018](#)). For the quality of learning and graduates to increase, the ministry of education and culture creates a development program for learning HOTS to improve the quality of learning and graduates (Ariyana, et al., [2018](#)). This program began to be developed following the Ministry of Education and Culture policy direction, which in 2018 was integrated strengthening character education and learning oriented to HOTS following the current education curriculum. Furthermore, in 2021 the Ministry of Education and Culture will start implementing a new program called the National Assessment as a substitute for the National Examination.

The National Assessment includes three aspects, namely Minimum Competency Assessment, Character Survey, and Study Environment Survey (Novita et al., [2021](#)). Minimum Competency Assessment assesses the basic competencies needed by all students to develop their own abilities and play an active role in society in activities that have positive values (Mendikbud, [2020](#)). Minimum Competency Assessment is used to measure students' cognitive abilities where the aspects measured are reading literacy and numeracy literacy (Novita et al., [2021](#)). The Minimum Competency Assessment is designed to encourage innovative learning that is oriented towards developing reasoning abilities, not focusing on memorization. So it can be concluded that the purpose of holding the Minimum Competency Assessment is to hone logic, critical thinking, and creativity. This is in line with the purpose of giving HOTS questions, which is to train students to think at a higher level

According to some experts, one of them is Resnick (1987) said that HOTS is a complex thought process in solving problems, drawing conclusions, representing, analyzing, and building relationships by involving the most basic mental activities. In line with this opinion Heong et al (2011) revealed that higher order thinking is using the thinking widely to find new challenges. Students who have higher-order thinking skills tend to have better learning achievement (Tanujaya et al., 2017). Ariyana et al (2018) state that higher order thinking uses a broader and deeper level of thinking to find something that is challenging, therefore the government strongly emphasizes the development of this ability on students, so that graduates get better and are expected to be progress in the education field.

In teaching practice in the classroom, the teacher plays an important role in the success of students. This agrees with the findings of Alhassora, et al. (2017), which mentions one of the factors that influences difficulties in applying learning oriented to higher order thinking skills, namely the teacher's factor. One of the improvements in the quality of students is done by teachers who focus on improving the quality of learning in the classroom with high level thinking skills oriented (Fitria et al., 2020). The design of improving the quality of learning is an effort to improve the quality of students which ultimately improves the quality of education in Indonesia.

There are several abilities of students that must be considered by the teacher in the learning process. Students as educational products according to Widarto, Parjono and Widodo (2012), are required to have eight main competencies, namely (1) communication skills, (2) critical and creative thinking skills, (3) inquiry/reasoning skills, (4) interpersonal skills, (5) multicultural/multilingual literacy, (6) problem solving, (7) information/digital literacy; and (8) technological skills. However, the facts in the field show that the competencies possessed by students are still minimal. This can be seen from the results of learning in class, national examination results as well as on the results of international assessments such as TIMSS and PISA. The 2015 PISA report showed that the quality of the education system in Indonesia was ranked 62 out of 72 participating countries (Novita, et al., 2021). This shows that the development of education in Indonesia is still far behind compared to other countries in the world. The eight competencies above are expected to be developed through learning oriented to Higher Order Thinking Skills (HOTS).

The main focus of mathematics learning goals and curriculum demands is to develop students' HOTS. HOTS is the ability to think that consists of critical thinking, creative thinking, and problem solving, Brookhart in (Retnawati, [2016](#)). This is in line with (Madu, [2017](#)) which states that the essentials in high level skills (HOTS) are the learners' skills in problem solving, questioning skills, reasoning skills, communication skills. Therefore, the program conducted by the Ministry of Education and Culture to emphasize the implementation of learning oriented to HOTS should be supported by teachers with starting from discipline in implementing learning oriented to HOTS, so that the ability critical thinking, creative thinking, and problem solving students can be developed.

Each teacher has their own methods which are used in teaching. Yen, et al. ([2015](#)) revealed that the role of teachers in HOT inculcating is another important aspect of HOT teaching effectively. So, based on this opinion it is said that the teacher's role in applying higher level thinking is another important aspect in teaching higher-level thinking effectively. The development of high level thinking skills of students is also likely to be influenced by the use of learning models or methods applied by teachers in the classroom.

In addition, the expectation of students development on higher order thinking skills should also be placed on the expectations of the teacher's good understanding of high level thinking skills (HOTS), these are the way the teacher views high level thinking skills and how to manage students' learning activities to develop these abilities. Therefore, this study was then conducted to find out several things including: 1) the learning that is often used in teaching mathematics in the classroom; 2) open responses about their knowledge toward HOTS; 3) the implementation of learning oriented to HOTS; 4) the challenges that teachers meet in providing learning oriented to higher order thinking abilities; and 5) their expectations of future mathematics learning. These aspects are then expected to be able to measure the extent of the readiness of teachers and students in implementing learning oriented to HOTS.

Method

This research is a phenomenological research. Phenomenological research is research to describe the general meaning of a number of individuals on various life experiences related to concepts or phenomena (Creswell, [2015](#)). Phenomenological research always tries to reduce personal experiences into a common meaning or universal essence (essentializing) of a phenomenon that

is experienced consciously by a group of individuals. It should be noted that the experience is an individual experience. The researcher collects stories from a group of individuals to look for similarities in meaning (Creswell, 2015).

Phenomenological research in this study describe the readiness of applying HOTS-oriented learning based on teacher teaching experience. This study included 16 mathematics teacher respondents from 16 different schools which included public schools and private schools in 12 different cities in Indonesia. Mathematics teachers who were respondents in this study were teaching experience of 3 years and below. All respondents were asked to provide their responses to open questions about :

- 1) the learning model that they often use in teaching mathematics in class;
- 2) their knowledge of HOTS;
- 3) the implementation of learning oriented to HOTS;
- 4) the challenges that teachers encounter in providing learning oriented to higher order thinking abilities; and
- 5) their expectations of future mathematics learning.

The data in this study were obtained through the distribution of google form links to a number of mathematics teachers. The open questions given to the respondents are as follows.

Table 1. The Open Question

No	Question
1	What is the name of the school you teach at?
2	In which city is the school where you teach located?
3	What learning model do you use most in class?
4	Why did you choose to use this model?
5	In the implementation of the Exam, precisely in Mathematics, many students complained about the difficulty of the questions given. What do you think about it?
6	Do you know about Higher Order Thinking Skills (HOTS)?
7	What do you know about Higher Order Thinking Skills (HOTS)?
8	Have you ever taught Higher Order Thinking Skill (HOTS) oriented in your Mathematics class? Why?
9	What learning model do you apply in teaching mathematics material that is oriented towards Higher Order Thinking Skills (HOTS)?
10	What difficulties do you encounter when teaching Higher Order Thinking Skill (HOTS) oriented mathematics? Why?
11	In your opinion, what should be improved so that the implementation of mathematics learning oriented towards Higher Order Thinking Skill (HOTS) can be carried out properly?
12	What are your hopes for the future of learning mathematics in the classroom?

Data were then analyzed using thematic analysis by classifying information obtained from respondents into several main points.

Result and Discussion

The results of the thematic analysis show that there are three main themes that affect the readiness of the implementation of learning that is oriented to HOTS, namely teacher, student, and others factors. The teacher is one of important factor in the successful implementation of HOTS-oriented learning. There are three sub themes identified, namely teachers' awareness, teachers' ability about HOTS, and appropriate learning model/method as seen in Table 2.

Table 2. Teachers' Factors

Theme	Subtheme	Elements
Teachers	Teachers' Awareness	<ol style="list-style-type: none"> 1. there is still a lack of teacher knowledge about HOTS 2. There are still teachers who have not implemented HOTS in the classroom 3. Orientation completing the material takes precedence over the process of developing student understanding
	Teachers' Ability about HOTS	<ol style="list-style-type: none"> 1. The teacher's experience in implementing HOTS oriented learning is still lacking 2. The teacher is not accustomed to directing students to think HOTS 3. The teacher is still confused when presenting HOTS questions
	Use of learning models/methods and HOTS question presentation	<ol style="list-style-type: none"> 1. The use of learning models is not entirely student centered 2. The questions presented in the learning process are not entirely about HOTS

Teachers' understanding of HOTS oriented learning largely determines the success of learning in the classroom. However, many teachers still do not realize the importance of applying HOTS oriented learning. Teacher's knowledge of HOTS is still lacking. This is indicated by the fact that there are still teachers who have never applied HOTS oriented learning in the classroom at 38% of the total respondents in this study. The questions presented by the teacher are still in the category of routine questions, so students are only accustomed to working on routine problems. This is in line with Abosalem (2016) who revealed that the focus of most teacher assessment items was more towards Bloom's lower taxonomic level. Besides Abdullah, et al. (2017) revealed the same thing, namely the low knowledge and practice Abdullah of applying HOTS mathematics teachers in the classroom. In addition, teachers also tend to be oriented to complete the burden of subject matter compared to trying to develop student understanding. This is due to the density of material that must be taught by the teacher.

Although there are 62% of respondents in this study who have already applied HOTS oriented learning, but they admit that they still have difficulty in presenting HOTS questions and are not accustomed to directing students to think HOTS, so HOTS oriented learning has not been fully implemented well in the classroom. Retnowati et al (2018) stated that teachers' knowledge about HOTS is still low. Some explanations given by teachers are general. In fact, there are many teachers who are still confused about distinguishing between HOTS and its strategies or learning methods.

The learning model used respondent in teaching in the classroom presented in a pie chart as shown in Diagram 1:

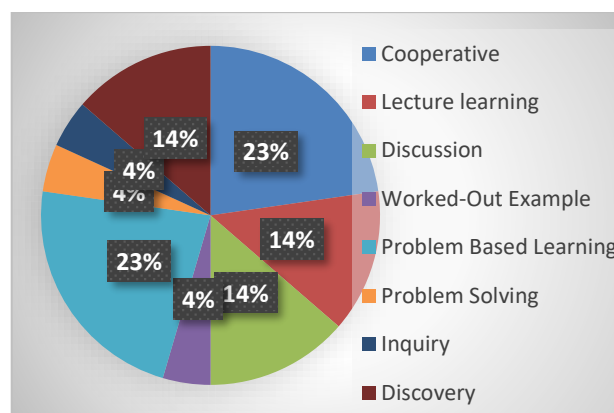


Diagram 1. Percentage of Use of Learning Models Used by Teachers in Classroom

The diagram above shows that the use of the most widely used learning model for teachers is the Cooperative learning model and the Problem Based Learning model with a percentage of 23% each. Then the learning model with the second largest percentage used by teachers when teaching in class is the lecture learning model, the discussion learning model and the discovery learning model with a percentage of 14% each. Next is the Worked-Out Example learning model, the Problem Solving learning model and the Inquiry learning model with a large percentage of implementation in each class of 4%. Although respondent have taught using various learning models, however the problems presented are still limited to procedural and computational problems that cause students to get used to solving only easy problems and difficulty in working on problems with higher difficulties.

In fact, from the other research, there are some method or model teaching that can help to improve the HOTS such as open ended approach in (Ernawati, 2016), thematic integrated module based on a guided discovery (Perwitasari & Djukri, 2018), PBL based learning (Jailani, Sugiman, & Apino, 2017; Tambunan, 2019), cooperative problem based learning model (Hariyati &

Tarma, [2018](#)), quantum teaching learning model (Ramadhani & Ayriza, [2019](#)), and scientific based pictorial storybook with PjBL method (Farindhani & Wangid, [2019](#)).

Table 3. Students' Factors

Theme	Subtheme	Elements
Students	Concept Understanding of Students	<ol style="list-style-type: none"> 1. There is still a lack of understanding of student concepts 2. The ability of students to connect various concepts is still low 3. Students still have difficulty finding the core of learning
	Students' Ability about HOTS	<ol style="list-style-type: none"> 1. Students are not accustomed to working on HOTS questions 2. Students still have difficulty in reasoning to solve HOTS questions 3. The student's creative and critical thinking are still low 4. The student's literacy ability is still low
	Students' interests	<ol style="list-style-type: none"> 1. Students are less active in solving problems 2. Students prefer to receive material directly 3. Students are more interested in solving problems that are procedural and computational

Most respondents in this study mentioned that students' understanding of concepts is still low. This causes students difficulty in answering the questions presented by using a combination of several concepts. The same thing was expressed by Fajriah, Sari, & Suryaningsih ([2020](#)) that students had difficulty understanding high level questions presented in student books. Students still need help from teachers to provide simpler examples because students' abilities are still low. The crucial difficulties experienced by the students in solving test problems were process skills and transformation difficulties (Hadi et al, [2018](#)). Students are accustomed to learning by being explained by the teacher, so that when learning is directed centered on students, students tend not to be able to find the essence of learning.

In addition, the teacher revealed that students were not accustomed to working on HOTS questions. Students' reasoning ability is still low so it tends to be difficult in solving HOTS questions. Respondents also revealed that the difficulties experienced by students in solving problems were also due to the ability to think creatively, critical thinking skills, and students' literacy abilities were still low and needed to be improved.

Another factor that also constrains the implementation of HOTS-oriented learning is students' interests. Respondents revealed that students were less active in solving problems given by the teacher. Students tend to be passive and prefer to receive material directly. In addition, students' interest in solving problems is still on procedural and computational problems.

In addition to the teacher and student factors, several things also determine the success of the implementation of higher-order learning. There are two sub-themes identified, namely time allocation and learning resources as seen in Table 4.

Table 4. Other Factors

Theme	Subtheme	Elements
Others	Time Allocation	<ol style="list-style-type: none"> 1. The limited-time available to teach HOTS-oriented learning 2. The density of the material that must be completed by the teacher
	Learning Resources	<ol style="list-style-type: none"> 1. Reference books are still lacking 2. Reference to contextual questions used in HOTS-oriented learning is still limited

In addition to the teacher factor, and the student factor, other factors also determine the successful implementation of HOTS-oriented learning, namely the allocation of time and learning resources. Respondents revealed that the limited time available to teach HOTS-oriented learning became an obstacle in the implementation of HOTS-oriented learning. Teaching HOTS-oriented learning requires more time, in addition to the material that must be completed by the teacher very much, students must be directed to be able to develop their thinking skills. To familiarize and facilitate students in developing higher-order thinking skills, the provision of learning resources such as reference books and a collection of contextual questions is needed. This is in line with the results of research from Pratama & Retnowati (2018) who stated that textbook is one of the important components in the learning process, including in mathematics learning. Although textbooks describe the minimal effort that teachers and students should undertake in the learning process, the textbook has a significant role, including in developing HOTS. Respondents in this study revealed that the reference questions/instruments that can be used to measure students' higher-order thinking skills are still limited. This is in line with the statement (Tanujaya, 2016; Kusuma et al, 2017; Ahmad et al., 2017) that assessment instruments designed to train HOTS are still lacking. Problems that occur in school, questions tend to test more aspects

of memory that are less training the higher-order thinking skills of students (Budiman & Jailani, [2014](#)).

Conclusion

Based on the results of the study and discussion of research results, it can be concluded several things namely, that there are variations in the use of learning models from 16 respondents in this study and the most widely used learning model is the Cooperative learning model and Problem Based Learning because these two learning models lead students to become active, creative, independent, critical thinking and more confident. Furthermore, although most respondents in this study already know the important points of Higher Order Thinking Skills (HOTS), their implementation in classroom learning is still limited. This is due to several obstacles that come from students, teachers, implementation time, and available learning resources. Therefore, it is important to improve and familiarize the implementation of Higher Order Thinking Skills (HOTS) oriented learning in the classroom for students, teachers, good time management, and the availability of learning resources that can facilitate the development of higher-order thinking skills. Thus, the readiness of teachers and students in applying to learn oriented to Higher Order Thinking Skills will be formed along with the habit of applying such learning in the classroom. If we never start it is difficult to expect progress in Higher Order Thinking Skill (HOTS) oriented learning, however, if Higher Order Thinking Skill (HOTS) oriented learning continues to be applied in the classroom and find solutions to each failure, the readiness of teachers and students will be formed with itself in the learning environment.

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