Application of HOTS (High Order Thinking Skill) in Science Learning During the Pandemic

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Abstract: The purpose of this research to know application of HOTS based science learning during the pandemic. The research method used is a literature study method, in which data is collected without going directly to the field and meeting directly with the respondents. The results of this study indicate that the application of HOTS in learning is able to solve problems and find solutions to problems, so as to bring up new discoveries that can be useful. In addition, the application of HOTS in learning is also able to improve student learning outcomes. Based on the results of research that have been studied can be concluded that the application of HOTS learning during the pandemic is able to improve student learning outcomes and make learning more meaningful.

Keywords: HOTS; Pandemic; Science learning

Introduction

The COVID-19 pandemic has changed the world of education at a rapid pace. One of them is the learning design that has changed, from offline learning or face to face directly in the classroom to online learning (in the network). Online learning can be carried out anywhere and anytime, without the need for a room. The thing that really needs is an internet network. Learning is a process of interaction between educators and students in a learning environment. In the implementation of learning, educators have an important role in creating a good learning atmosphere, so preparation is needed before carrying out learning. As for what needs to be prepared by educators before carrying out learning, one of which is learning tools. Learning tools is that prepared by the teacher to carry out learning activities and has a role as a guide for educators in carrying out learning in the classroom (N. M. Sari et al., 2020).

Learning tools consist of the learning planning stage, learning implementation stage, and learning evaluation stage. In preparing learning plans, educators also need to determine what learning models and approaches will be used, so as to provide student interest in participating in learning. Student interest in learning will help improve student learning in aspects of knowledge (cognitive), attitude (affective), and behavior (psychomotor). Students are trained to be able to remember, understand, apply, analyze, evaluate, and create using high order thinking skills (HOTS). This is in line with the demands of the 2013 curriculum, namely the quality of learning that can make students able to be creative, independent, cooperative, solidarity, leadership, empathetic, tolerance, and life skills in order to shape character and improve the nation's civilization and dignity. HOTS (High Order Thinking Skill) is a thinking process that is not just memorizing and relaying known information (Basis et al., 2020). Higher order thinking skills as a form of ability to connect, manipulate, and transform knowledge and HOTS learning models that can be applied in learning during the COVID-19 pandemic.

Learning that is applied during the COVID-19 pandemic is distance learning or online. Distance
learning has various impacts on the world of education, both for teachers and students. One of the negative impacts of distance learning is the lack of interaction between teachers and students caused by various factors, one of which is the system, for example due to the influence of signals or networks (Hadisi et al., 2015). The change in the learning process from face-to-face to distance learning has caused many schools to use certain applications as a tool to carry out learning, one of the most frequently used applications by teachers is Google Classroom and WAG (Whatsapp Group). The change in the learning process should not be a reason for teachers not to facilitate HOTS to students in online learning. Teachers must continue to make learning implementation plans that are able to facilitate and train students’ HOTS, so that they are in accordance with learning objectives and achieve the demands of the 2013 curriculum.

HOTS is known as higher order thinking skills in terms of cognitive domain in Bloom's Taxonomy. The Bloom’s Taxonomy that includes HOTS category is C4 (analyze), C5 (evaluate), and C6 (create). HOTS can be applied in learning, one of which is by providing HOTS-based questions which are of course in accordance with the learning materials studied by students. In science learning, the application of HOTS questions is very necessary, because these questions are able to test students' science process skills, so that in this case they can not only know students' higher-order thinking skills, but also simultaneously know the level of students' science process skills. This is in line with Hutabarat (2019) which states that in its application HOTS is closely related to science learning, because the process to achieve HOTS is in line with the character of the science learning process. Where, science is a science that studies events that occur in nature which includes organized knowledge, ideas, and concepts about the natural surroundings, obtained from experience through a series of scientific processes including investigation, compilation, and presentation of ideas. In principle, science is a way of finding out and procedures for doing or doing, so that it comes to the process of concluding (Samtowa, 2011).

### Method

This article is a form of qualitative research with the method used is a literature study, which is a research method in collecting data without going into the field and meeting respondents directly. The data were obtained from previous researchers who were in line with the research being. In this study used sources that originated from 19 scientific journal and 6 books.

### Result and Discussion

**Definition of HOTS (Higher Oder Thinking Skill)**

Higher Order Thinking Skill (HOTS) or higher order thinking skills is a complex thinking process in describing material, making conclusions, building representations, analyzing, and building relationships involving the most basic mental activities (Mustaghfirin, 2019).

HOTS-based learning is different from LOTS-based learning. This is in line with Sani (2019) which states that there is a difference between learning activities in HOTS and LOTS-based learning. The differences can be seen in table 1 below:

### Table 1. Differences in Learning Activities of HOTS and LOTS

<table>
<thead>
<tr>
<th>LOTS</th>
<th>HOTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive in thinking</td>
<td>Active in thinking</td>
</tr>
<tr>
<td>Solve the problem</td>
<td>Formulate the problem</td>
</tr>
<tr>
<td>Studying simple problems</td>
<td>Studying complex problems</td>
</tr>
<tr>
<td>Convergent thinking</td>
<td>Divergent thinking and developing ideas</td>
</tr>
<tr>
<td>Learn from the teacher as the main source of information</td>
<td>Searching for information from various sources to think critically</td>
</tr>
<tr>
<td>Practice solving problems and memorizing</td>
<td>and solve problems creatively</td>
</tr>
<tr>
<td>Prioritize factual knowledge</td>
<td>Think analytically, evaluative, and draw conclusions</td>
</tr>
</tbody>
</table>

HOTS is a thought that challenges students to interpret information (Suhandooyo et al., 2016). This is in line with what was stated by Johnson in Helmawati (2019) which defines that higher-order thinking is a skill in processing information to be more developed. HOTS has several indicators which include analyzing (C4), evaluating (5), and creating (C6) (Widana, 2017). In the era of the 21st century, higher order thinking skills are needed to be taught to students, in order to be able to compete (Lu et al., 2021). Students who have high-order thinking skills have good evaluation skills and are able to create something (Samritin, 2014). This means, students who have high thinking skills will be able to solve problems and find solutions to these problems. In this 21st century, this ability is needed, where the problems and competition that occur are increasingly complex, so that from thinking like that will emerge new discoveries that can save mankind.
Application of HOTS in Science Learning in the Pandemic Period

HOTS is one of the abilities that is a concern in the 2013 curriculum. The current assessment standard is more focused on learning outcomes that prioritize HOTS (Masitoh et al., 2020). However, in reality the learning that occurs in the field is still not all HOTS-oriented. Based on the results of research conducted by Nurwahidah (2018) in Semarang which states that the HOTS ability of some students is still relatively low. There are still many students who have not been able to carry out the process of reasoning and problem solving. The low level of HOTS ability is caused by students who are not used to working on HOTS questions and the media and teaching materials used by teachers cannot trigger students to think at higher levels. One of them is that the LKPD used in learning does not pay attention to the HOTS aspect to develop students' abilities (Kadarisma et al., 2020).

In a study conducted by Dian et al. (2022) showed that E-LKPD-based Problem Based Learning (PBL) can improve the ability of HOTS in science learning. This is indicated by an increase in students' higher-order thinking skills after using the PBL-based E-LKPD in the medium category. This is in accordance with the results of research conducted by Widoartti et al. (2021) that PBL can train students to be able to solve problems. In addition, research conducted by Syaifulloh et al. (2017) shows that Problem Based Learning (PBL) has a significant influence on problem solving abilities, especially related to HOTS. This is also in line with the research results of Rozi et al. (2019) which states that the application of HOTS-based learning is able to provide meaningful and enjoyable learning experiences for students.

Based on the results of research conducted by Jannah (2021) shows that the application of HOTS questions in science learning needs to be varied so that all higher-order thinking skills can be trained through these questions. Another study related to the application of HOTS in science learning is a study conducted by Nevi (2018) which concludes that the implementation of HOTS science learning using simple tools can invite students to find their own concepts in learning, train students to be sensitive in participating in solving problems that occur in the classroom. Environment, doing learning by finding concepts or applying the concepts learned directly, so that learning becomes fun and meaningful. In addition to the two previous studies, the application of HOTS in learning was carried out by Winarno et al. (2015) which resulted in an integrated science module based on HOTS on the energy theme that was developed, which could improve student learning outcomes seen from the comparison of the average scores of students before and after using HOTS-based integrated science module on the energy theme.

The application of HOTS learning during the pandemic is able to improve student learning outcomes (Mikly et al., 2021). This is in line with the results of research conducted by Larasati (2020) which states that there is an effect of discovery learning models based on higher order thinking skills on HOTS learning outcomes. Other research that is in line is research conducted by Saraswati et al. (Saraswati et al., 2020) that learning uses various thinking abilities of students individually and in groups as well as the real environment to overcome problems, so that it is meaningful, relevant, and contextual. Research conducted by Handayani (2022) proves that the Problem Based Learning (PBL) model can improve the creative thinking skills of fifth grade students in science learning in pandemic conditions with the PTMT system. PBL is a learning strategy that encourages students to develop critical thinking skills and be able to solve problems and communication skills. This shows in theory that PBL has an effect on HOTS abilities, so that in improving student learning outcomes in learning, an appropriate strategy is needed, one of which is PBL as a learning strategy that is able to increase students' HOTS (Syaifulloh et al., 2017).

Conclusion

Based on the results of the research and discussion, it can be concluded that the application of High Order Thinking Skills (HOTS) learning during the pandemic was able to improve student learning outcomes and make learning more meaningful.

Author Contribution
Nuryunita Dewantari: writing-original draft preparation, result, discussion, methodology, conclusion, review, and editing; Suwito Singgih and Riva Ismawati: analysis, review and editing.

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Conflicts of Interest
The authors declare no conflict of interest.

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