

The Way of Biology Teachers to Train HOTS to the Students in Online Learning Process

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Abstract: The implementation of HOTS in the learning process is considered capable of improving the quality of education in Indonesia. However, in online learning conditions, there are many obstacles and limitations to training HOTS in Biology lesson. This study aims to describe biology teachers' knowledge, preparation, and implementation of HOTS training during online learning. This study uses a qualitative approach to the type of phenomenology. This study involved 12 Biology teachers at SMA and SMK in West Java. The data collection technique is carried out through interviews via WhatsApp Call. The data analysis technique used is through reduction, data review, and conclusions drawing. Based on the results of data analysis, it was found that the teacher's understanding of HOTS learning is still weak, and the implementation of HOTS training during online learning is still not optimal. The most widely used learning model is Problem based Learning. The constraint implementation of online HOTS training is inseparable from the online learning barriers, but teachers also continue to try to handle these barriers with various solutions.

Keywords: Biology; HOTS; Online learning.

Introduction

In our daily life, it is a normal thing for us to encounter problems that need to be solved through interpretation and analysis. When we need a job or to get our business developed, for instance, we need high-level way of thinking. Due to the development of time, a well-skilled and competent human resource is a demand, and it turns the educational paradigm to the 21st century way of learning (Care et al., 2018). This is related to education because education is something needed to create a better civilization (Häkkinen et al., 2017; Saido et al., 2015). In Indonesia, 21st century learning has been implemented through the implementation of the 2013 curriculum and the latest independent curriculum.

The definition of 21st century learning refers to the phenomenon of education in the 21st century, including the globalization of education, culture and national character, also the internet usage that becomes a culture

which is increasingly attached to everyday life. Therefore, the 21st-century learning is an effort to facilitate students today to get the best learning experience and achieve learning goals effectively (Putro et al., 2019). The 21st-century learning contains four skills, those are critical thinking, collaboration, creativity, and communication (Care et al., 2018). The pupils should be able to master these four skills. Two of these skills, namely critical thinking, and creativity, are included in higher-order thinking skills (Astutik et al., 2017).

HOTS (Higher Order Thinking Skills) is a human's ability to gather information and apply it for problem-solving (Sani, 2019). Thinking skills which the parts of HOTS are problem solving, decision making, critical thinking, and creative thinking (Bissell & Lemons, 2006; Potts, 1994). Whereas in Bloom's Taxonomy, HOTS is the level of one's thinking at the stages of analyzing (C4), evaluating (C5), and creating (C6) (Anderson & Krathwohl, 2010). Therefore, HOTS is the skill of

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combining and synthesizing knowledge for problem-solving, decision-making, innovation, and creativity.

HOTS-based learning can be applied to all subjects, including Biology. According to (Ramdiah et al., 2019), the characteristics of science learning are suitable for the HOTS empowerment process because science focuses on logical understanding, emotional understanding, responsibility, moral reasoning, and various higher-order thinking skills such as intuitive thinking, hypothesis testing, problem-solving and critical thinking (Garcia, 2015). Teaching HOTS does not mean to teach the material about HOTS only, but connecting the higher-order thinking skills to one another in solving problems (Siagian & Sagala, 2021). Carrying out HOTS-based learning means that these learning activities can trigger the students to think at a higher level. This can be integrated through several aspects of learning supports, such as learning materials, learning media, and learning models and strategies (Ichsan et al., 2020). The regulation of Permendikbud Number 22, 2016, promotes HOTS-based learning including through Inquiry Learning and Problem-based learning.

However, the situation in the field shows that the implementation of HOTS-based learning still needs to be improved in Indonesia, some research reveals that HOTS-based learning is constrained by various factors such as the lack of teacher competence in preparing and implementing HOTS-based learning, the low motivation of students to learn HOTS, and the lack of infrastructure to support effective implementation of HOTS (Dima et al., 2021; Feronica et al., 2021; Ginting & Kuswando, 2020; Kurniawan, 2020; Putra & Iswanti, 2020; Ramdiah et al., 2019; Retnawati et al., 2018). Teachers at least need to master HOTS to be able to transfer these skills, the lack of competency affects the teaching process (Kurniawan, 2020). On the other hand, students also have more challenges when learning HOTS. However, this does not mean that HOTS cannot be implemented (Juhansar et al., 2018), teachers and school apparatus need to continue to improve the implementation of HOTS-based learning in all conditions. Changes in the implementation of learning during Covid-19 are a new challenge for implementing HOTS-based learning. Several new obstacles have emerged, such as reduced learning hours, uneven internet distribution, limited online learning infrastructure, and the limited ability of students to absorb the material being taught, which have become obstacles to practicing HOTS during a pandemic (Ritonga et al., 2021).

Practicing HOTS in learning is relevant for improving the quality of education, but this is restricted by online learning during the pandemic which presents various challenges. Even so, training HOTS during a pandemic need to be continued. Now, how do the teachers teach biology that are scientific and compatible

with HOTS? How do the biology teachers train HOTS for students during the pandemic? Previous researchers had uncovered teachers' knowledge about HOTS, HOTS-based learning preparation, and implementation of HOTS-based learning (Fatimahtuzzahroh et al., 2021; Ichsan et al., 2020; Ritonga et al., 2021; Sa'adah et al., 2020; Sirait et al., 2021). The current research will reveal these aspects at the high school level on specific subject of Biology. Based on this description, this study aims to describe the knowledge, preparation, and implementation of HOTS training which is done by the biology teachers at several high schools in West Java during the online learning.

Method

This research used is qualitative with a phenomenological approach. The phenomenon that occurs is the challenge for the teachers who train HOTS during online Biology learning. In a new way and approach of learning, the teachers must adapt to different ways of practicing HOTS, especially at teaching Biology. Therefore, this study aims to describe the knowledge, readiness, and implementation of high school Biology teachers to train HOTS during online learning. The participants in this study were Biology teachers who teach at SMA or SMK in West Java. 12 teachers of 11 SMA teachers and 1 SMK teacher. Participants were randomly selected and all of them had experienced teaching online.

Data was collected through online interviews on *WhatsApp Call* from October to December 2021. The topics which were discussed in the interview covered three things - teacher's knowledge about HOTS, preparation for HOTS-based learning online, and implementation of HOTS-based learning online. The research instrument is an interview guide. Interviews were recorded and then script was made for data analysis purposes. The data analysis technique was obtained through reduction, data presentation, and conclusion-making (Miles & Huberman, 1994).. The data reduction process is a process of transforming interview data to find the correlation between the answers among all informant, as well as between one sub-theme and another. Presentation of data means organizing and making a summary of interrelated data to enable researchers to draw conclusions. The results of the interviews which were gotten from 12 informants, were presented in a table according to the sub-theme, and their answers were reduced so that conclusions obtained would be related to the sub-themes.

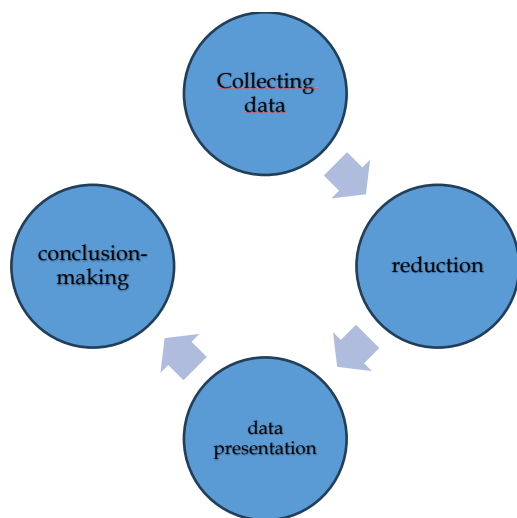


Figure 1. Analysis Technique

Result and Discussion

The condition of online learning presents a challenge to teachers as the first liners to teach HOTS to students. The following are the results of interviews with Biology teachers who were the subjects of this research. The results of the research are explained one by one according to the sub-themes as follows.

Teacher's Understanding about HOTS

In the teacher's understanding about HOTS two things are discussed, namely the teacher's knowledge about hots and the teacher's knowledge about ideal Biology learning.

Teacher's Understanding about HOTS

Based on the analysis of interview data, it can be concluded that the teacher's knowledge of HOTS is inadequate. Teachers do understand HOTS in general, as they know it means the ability to think at a higher level than the level of knowing and memorizing, namely the cognitive level in Bloom's Taxonomy at C4 (analyze), C5 (evaluate), and C6 (create), but there is a misconception of R6 and R10 that understand HOTS as a type of assessment instrument, not skills. Only one teacher who understands HOTS as soft skill in using various information and correlating them one another to solve problems, innovate, or be creative. These findings were in line with results of a research (Pusparini et al., 2020; Retnawati et al., 2018) that revealed teachers' understanding of HOTS is still low. Teachers do not understand HOTS conceptually well, but they only understand HOTS as the three highest levels in Bloom's taxonomy (analyze, evaluate, and create). Whereas HOTS is not just that. It also is including higher order thinking skills, creativity, logic, problem solving, reflection, and metacognitive. Teachers have not been

able to distinguish abilities, skills, learning methods, and learning activities. The results of the teacher's understanding interview about HOTS can be seen in Table 1.

Table 1. Teacher's Understanding About HOTS

| Theme | Conclusion |
|--|--|
| HOTS is not only thinking about memorizing or understanding but also involving higher things than that (R4) | In general, the teachers know HOTS as high-level thinking skills (analyze, evaluate, create), but some of them only know the translation and there are still misconceptions that HOTS is only the form of questions. |
| HOTS does not only think about memorizing or understanding but it also means that students can apply/apply, analyze, evaluate and create products (R1) (R3) (R8) (R5) (R9) (R12) | |
| HOTS is not only knowing, but the skills of students to process information, be critical, be creative, continuously developing metacognitive skills (R11) | |
| Critical thinking skills (R2) (R7) | |
| HOTS is a type of question (R6) (R10) | |

Based on the Law Number 14 of 2005 that concerns about teachers and lecturers, says that for a teacher is someone who educates, trains, guides, and directs students, therefore the development of teaching competencies is important to keep improving. In this case, the competence of teachers in training HOTS still needs to be improved continuously, so that the learning process is in accordance with the goals. If the teacher's understanding of HOTS is still lower than it must be, then learning could be not in accordance with the initial directions and objectives that have been prepared by the government.

Ideally Teach HOTS According to Biology Teachers

The aspect of understanding regarding to the implementation of HOTS-oriented learning represents the teacher's capability in managing learning activities (Badjeber et al., 2020) in the process of preparation, implementation, and closing. Based on the interview results, there are various perspectives about ideally teaching HOTS in Biology learning. Most respondents

thought that the ideal HOTS teaching in Biology learning was to direct class activities to find out or acquire their own knowledge. These activities can be implemented through group discussions and contextual problem analysis. On the other hand, the teacher is only a learning facilitator, not a learning subject. This answer describes a good understanding, as Sesmiyanti (2021), in his research explained that HOTS-based learning involves students to analyze, evaluate, and create. If in learning students are not stimulated to solve problems, then the learning is not based on HOTS. Therefore, the researcher concluded that some teachers quite understand HOTS-based learning.

Table 2. Reduction of Interview Results of How Teachers Teach HOTS Ideally in Biology Learning

| Theme | Conclusion |
|---|--|
| Students are directed to find out for themselves, either by discussing contextual problems or inquiry or various approaches. There will be an activity of analyzing, not just memorizing. The teacher is only a facilitator (R2, R4, R6, R7, R10, R11, R12) | Teachers have different perspectives, most argued that teaching HOTS was ideal by directing students to find out for themselves, either by discussing contextual problems or inquiry or various approaches. There is an activity for analyzing, not just memorizing. The teacher is only a facilitator. There are also those who think that the ideal way to train HOTS is to prepare a lesson plan well, practice HOTS consistently, practice through HOTS-based questions and use certain media/methods. |
| Get trained with HOTS-based questions (R1) (R5) | |
| HOTS is taught consistently (R3) | |
| Using certain media, practicum, and projects (R8) | |
| The complete RPP (R9) | |

Some of the other teachers mentioned other things related to learning tools, namely: 1) RPP is a component that needs to be well-prepared; 2) using HOTS-characterized questions to train the students. These two things are the important components in learning. These components can strengthen and support teachers in training HOTS. As according to (Bichi et al., 2019; Ilma et al., 2021; Kriswantoro et al., 2021), learning and assessment are the parts of one unit, and one of the ways of practicing HOTS is through HOTS-based questions (Rahielanamy & Kamaludin, 2022). Interviews related to these answers have been reduced and provided in table 2.

HOTS-Based Learning Preparation

Based on the experiences which expressed by Biology teachers in the interviews, learning Biology based on both HOTS and LOTS needs the well-prepared lesson plans, media, and methods according to the material that will be delivered. However, the difference that stands out is in complementary devices, for example modules, worksheets, and teacher knowledge. In the learning module/worksheet based on HOTS, there are needs for the instructions/narrations to lead the activities of students to develop their thinking skills. For example, if in one of the syntaxes they need to find information, then the work procedure is given a directive sentence for students are looking for information. Anisah and Latuti (2018) said that there are three important aspects that must exist in HOTS-based teaching materials, namely: 1) teaching materials developed must be able to provoke students to develop their reasoning abilities; 2) teaching materials must be able to provoke students to analyze and evaluate the problems given; and 3) the teaching materials developed must be able to stimulate the thinking processes of students to create and think of alternative answers to each given problem. Research results by Ramadhan et al. (2020); Astra et al., (2021); Santoso et al. (2021) said that HOTS-based modules can be a facility for training HOTS students. Even according to Kahar et al. (2021) HOTS-based student worksheets can also increase motivation and learning outcomes.

A high school teacher, R7, said that lesson plans based on HOTS and LOST both provided their own challenges in their preparation, so it was better to make lesson plans using HOTS eventually. The advantages of HOTS-based learning lesson plans are that they are more complex, so teachers must also think in HOTS terms both in the delivery of apperception, materials, and evaluation. However, with the condition of distanced learning, the composition of the lesson plans for online learning has changed. Mubarak (2021) said that the RPP nowadays is at least in accordance with the directions of the 2013 revision of the 2017 curriculum, namely raising four kinds of things including Strengthening Character Education (PPK), literacy, 4C, and HOTS. Thus, it is no longer relevant if the method, strategy, or model used is an approach that is centered on teacher's activity. The approach used must activate students in learning (*active learning*). The results of the study Sa'adah, Jamaludin and Rahman, 2020) revealed that HOTS-based lesson plans using online methods are actually clearer than lesson plans for face-to-face learning, hence their preparation is easier.

Based on the description above, it can be concluded that the biology teacher's understanding of preparing for HOTS learning is quite good. Respondents' statements have been reduced and can be seen in Table 3.

Table 3. The Reduction of Interview Results about the Differences of Biology Teachers in Preparing HOTS and LOTS-Based Learning

| Theme | Conclusion |
|--|--|
| Preparation (RPP, media, method) adapted to the situation and ability (R1) (R2) (R3) (R4) | Learning preparation (RPP, media, methods) is adjusted to the circumstances and abilities. The difference is in HOTS material which is more complex and complementary tools for HOTS require modules/worksheets. |
| The difference is in the complementary devices (modules and articles for example) (R5) (R6) | |
| Equally troublesome, it's better to prepare HOTS as well (R7) | |
| The difference is in the readiness to deliver the material and practice (HOTS is more complex so the teacher must really understand) (R8) (R9) (R10) (R11) | |

Implementation of HOTS-Based Biology during Online Learning

Implementation of HOTS-Based Biology during Online Learning

Based on the results of interviews, the teacher revealed that he could carry out HOTS-based learning while online but was not as optimal as face-to-face learning. This is because there are obstacles. Teachers with severe difficulties admit that the main obstacle is inadequate facilities from both the ability of the school and students, so that learning is only through assignments. Teachers with less-than-optimal implementation utilize modules/worksheets, questions, and assignments to facilitate students practicing HOTS independently or virtually from their respective homes. Fatimahtuzzahroh et al. (2021) in her research confirms that when HOTS learning online is not optimally done, it can be seen from the way the teacher starts the class and from the conditions students have during the learning process. Worksheets, media, and other tools can support the learning process, but teachers cannot be sure whether students are doing their own work or being done by someone else. In addition, interaction between students and teachers is also limited. Beside that, one of the teachers, R11, revealed that HOTS learning can be

done online, but the teachers must be ready in utilizing provided facilities to maximize the learning process.

According to (Muqit, 2022; Ritonga et al., 2021), based on the results of his research, online HOTS learning can be implemented through three activities at Bloom's taxonomy level, namely analyzing, evaluating, and creating. Students can analyze learning events or topics through YouTube video content, then students can mutually respond to the results of video analysis resulting in exchange of ideas, arguments, and evaluations of one another. In addition, Instagram, Facebook, and other media can be media for students to be creative. This opinion shows that online learning can open new ways for teachers to innovate in learning. But it goes back to the readiness of each teacher. The implementation of HOTS-based learning is concluded from the results of interview reduction which are given in Table 4.

Table 4. The Reduction of HOTS Learning Implementation Interview Results when Online

| Theme | Conclusion |
|--|--|
| Haven not been implemented (R1) | One teacher stated that he had not been able to implement HOTS training online. 7 |
| Can be implemented but not optimal (both implementation and results) because there are limitations (R2) (R3) (R4) (R6) (R8) (R12) | teachers said they could implement it but not optimally, and 4 teachers said they could implement it through modules, questions, or assignments. |
| Can be implemented through assignments or assisted by applications in schools where the teacher can already operate the application (R7) (R9) (R9) (R10) | |
| Very doable, if the teacher is ready (R11) | |

Learning Models for Practicing HOTS by Online

There are groups of answers of learning model used to train HOTS online in Biology lessons. The first group answered related to train HOTS with the learning media used, namely literacy sources and videos. The literacy sources in question are all reading sources that students can use to solve problems in HOTS-based learning. The reading can be sourced from books, internet searches, or other sources. By the first group, literacy sources are considered as sources of information when investigating or analyzing activities. In addition, reading sources can also trigger students' curiosity so that they carry out

investigations. Likewise, video acts as a literacy resource that supports the learning process. Laksono and Wibowo, (2022) revealed students' thinking skills can be trained through the learning resources used.

R2 reveals:

"The most helpful learning model is using articles or other literacy, for example I give articles to children to read, then the children are asked to analyze the topic of the problem so that it can be material for discussion, exchange of ideas."

Additionally, the R10 reveals:

"Using video, because of that the role is quite big, yes, students are given material or asked to analyze a video, students can also seek new knowledge from the video."

According to the second group, the most appropriate learning model for practicing HOTS is Problem based Learning, Project based Learning, role playing, scientific issue and varied. According to R11 Problem based Learning (PBL) and Project based Learning (PjBL) is the most effective model for training HOTS.

R11 delivers:

"At the PBL and PjBL stages, students are stimulated from the start by giving them problems, then they work together in a group to investigate more deeply; there will be an interaction and merging of ideas up to conclusions, which really describes students' HOTS activities."

Yustina and Mahadi (2019) stated that *e-learning* with *problem-based* learning model can be implemented, for example through contextual problems in everyday life, so that students are trained to process existing information and arrange it based on their own knowledge. Yustina and Mahadi (2019) also argues that PBL with *e-learning* can cover the lack of space and time for student learning. Learners are facilitated to study anywhere and anytime with a variety of learning resources to develop their critical thinking skills. In addition, research results Rezkillah and Haryanto (2020) conclude that HOTS-integrated PBL learning has a positive effect on critical thinking skills and self-confidence. Following are the results of data reduction related to the learning model used to train HOTS when online in Table 5.

Table 5. The Reduction of Interview Results Learning Models to Practice HOTS during Online Learning

| Theme | Conclusion |
|---|---|
| Literacy (R2) | The teacher discusses the learning model based on two focuses, from the media and learning models. Based on the media the teacher uses literacy resources and videos to train HOTS; on the other hand, based on the model, the teacher uses the PBL, PjBL, <i>role playing</i> , and <i>scientific issue</i> to train HOTS. |
| Models with Video (R10) | |
| <i>Problem-based Learning</i> (R5) (R8) (R9) (R11) | |
| <i>Project-based Learning</i> (R6) (R9) (R11) (R12) | |
| Varies (R6) | |
| <i>Role playing</i> (R7) | |
| <i>Scientific issue</i> (R4) | |
| Model accompanied by video (R3) | |

Obstacles to Practice HOTS during Online Learning

Based on the results of the interviews, the obstacles to teaching HOTS in online Biology lessons are inseparable from e-learning problems. All teachers experienced problems with the facilities such as gadget, internet data, and signal. Having no gadget becomes the first problem, because not all students have it, using parent's gadget, or even shared with a friend's gadget. If there is no gadget at all, students cannot attend the online learning. However, students who have gadgets cannot be separated from the problems which are inadequate internet data and signal. Some students only have the data for chatting, so they can just access chat personally on WhatsApp. In addition, schools which are located in rural areas have difficulty to get an adequate signal so they must go to another place to get a better signal, and even if they get the better internet connection, not all class can be finished.

One school experienced these two problems so it could not organize learning through video conference. This is supported by the statement of Gunawan et al. (2021) that implementation constraints virtual meeting that is inadequate internet signal and quota, and difficulties in supervision. Pohan (2020) revealed infrastructure is the main problem during online learning, especially in underdeveloped areas. Other obstacles faced by students, teachers and parents include the lack of ability to use technology, students' financial and psychological problems, and the lack of procuring teacher handbooks to conduct meaningful online learning. So, the procurement of these books is necessary and must be distributed evenly to schools throughout Indonesia.

Learning through virtual meeting also provides new challenges. First, the reduction in class hours causes teachers to need to redesign how to teach HOTS with limited time. Research Muqit (2022) found the learning conditions of students while studying at home certainly affect learning motivation. R11 says:

"The mental and psychological condition of a child when he goes to school is of course awakened to be ready to learn, but when at home the psychologist who is awakened is usually hungry, wakes up and is still sleepy and wants to play, that is a problem for children's learning readiness and motivation."

Table 6. Reduction of Obstacle from the Interview Results of Teaching HOTS in Biology Online Learning

| Theme | Conclusion |
|---|--|
| Lack of adequate facilities, internet data and signal (R1) (R6) (R9) (R11) (R7) | The obstacles to teach HOTS during online learning are lack of facilities (internet data, signal, and gadgets/laptops); less time; low student motivation; students cannot be controlled directly; and the teacher's own knowledge that still needs to be explored in teaching HOTS. |
| Lack of motivation/enthusiasm for student learning (R2) (R7) (R11) | |
| Tight time (R3) | |
| Different abilities of students (R4) (R5) | |
| Learners cannot be controlled directly (R4) (R8) (R10) (R11) | |
| Teacher's understanding about HOTS is still low (R5) | |

In addition, teachers also lack the ability to control students during online learning. The position of students and teachers who are far apart is added by a video conference with off camera makes the teacher does not know whether the students are studying seriously or not. Besides, some students do not do the assignments given by the teacher, because making the assignments is a difficult part to control in online learning.

The last obstacle is the teacher's knowledge in training HOTS. R5 said that the teacher's knowledge about HOTS will affect enormously because professional teachers will create a class that supports HOTS training. However, if the teacher has inadequate ability in teaching HOTS, learning process will be difficult to carry out. According to Muqit (2022) the teacher's lack of understanding of HOTS concept and its application in learning is a problem from the teacher's side. HOTS skills must first be possessed by the teacher before they train the pupils (Abosalem, 2016). The results of the data reduction of five constraints are presented in table 6.

Solutions for Biology Teachers in Overcoming Obstacles in Teaching HOTS by Online

Based on the five obstacles to teaching HOTS during online learning discussed in the previous point, interview respondents sought several solutions which were summarized into five points, which are: 1) to overcome students' enthusiasm for learning, the teacher took a personal approach through personal chat to ask students' obstacles in understanding the material provided. 2) To deal with students who are lagging or unable to attend class hours, the teacher provides other time outside of class hours. For example, if during class hours students cannot follow video conference, the teacher will send teaching materials or assignments that have the same weight as the students who take part virtual conference. 3) To overcome the obstacles about teacher readiness, teachers must prepare learning materials in advance. 4) To overcome the constraints of attendance and controlling students, teachers work closely with parents, homeroom teachers, and BK. Students carry out online learning at their respective homes, meaning that the closest control of students is parents, thus parents need to be actively involved in controlling students during online learning. Sarwa (2020) revealed during online learning, the role of parents is as important as the teacher. Parents as the closest controllers of students can be involved in helping students master competence, guiding them to be in the right direction of learning, along with the students choosing the skills to be mastered, and encouraging them to get to know their community and environment. So far, family assistance is the closest solution to conditioning distance learning. R11 revealed that the role of the homeroom teacher is important. The homeroom teacher has the authority to reprimand students who do not participate in teaching and learning activities (KBM). If the student is absent within a certain period, the student will be followed up by the Guidance and Counseling teacher. The interview reduction results for the four solutions can be seen in table 7.

Based on all results of data reduction on teacher's knowledge, readiness, and the implementation of HOTS-based Biology learning in SMA 12 teachers in West Java, it can be said that the results are quite good. This is implied in the readiness and implementation of teachers in carrying out HOTS learning, although there are obstacles, but they also are accompanied by solutions they try to figure out. The new conditions do provide challenges, but this does not mean that HOTS training cannot be carried out. On other hand, it seems that there is still a need to increase teachers' understanding and skills in training HOTS, given that there are still teachers who have misconceptions about HOTS and that the readiness of them is a big factor in the implementation of high-quality learning. According to Setyowati,

Sarwanto and Muzzazinah (2021), special HOTS-based teaching skills training is a solution to increase these skills. Teachers must understand the concepts and procedures of teaching in any conditions. It is expected that the training will be attended by all teachers from both public and private schools and from urban and district areas. This is supported by the results of the Student Creative Program (PKM) by Izzati et al. (2020) who concluded that training activities could increase teachers' understanding on HOTS and increase their motivation to develop HOTS-based assessment instruments.

Table 7. Reduction of interview results Solutions for Overcoming Challenges of Practicing HOTS during Online Learning

| Theme | Conclusion |
|---|--|
| Approach students by contacting them directly through <i>chat</i> or interact with jokes when meet them, so that they will be happy with the teacher (R2) (R6) (R9) | The solution used is the teacher approaches students through <i>chat</i> or direct interaction so that children can be close or open to teachers, especially for students to take part in learning; the teacher provides additional hours outside of class hours; because time is limited, the most important points are prepared in advance; the teacher gives a summary of the material, or is given the task of making children <i>mind map</i> |
| Provide additional hours outside of class hours (R2) (R6) (R11) | material that has been studied; and teachers work closely with parents to control children. |
| Learning groups of students who lack facilities with students who have facilities (r6) | |
| Arrange things to be conveyed in advance and convey them gradually (R3) (R5) (R8) (R12) | |
| Provide a summary of the learning material or ask students to make a map concept (R4) | |
| Collaborate with parents, homeroom teachers, and BK to control students (R10) (R11) | |

This study only discusses three aspects in learning, which are teacher's knowledge, readiness, and implementation of HOTS-based learning. But of course, there are still many things that can be studied related to online HOTS training, for example the extent to which family assistance is effective in distance learning, or resistance studies and evaluation techniques used while training HOTS in online learning. Besides, the online

learning environment can also be an interesting study to research or develop into a new class environment.

Conclusion

The results of the research show that the biology teacher's knowledge about HOTS is still low, teachers need to increase their understanding and training skills. This means that teachers must be able to create online learning according to the criteria of the 21st century. Moreover, the preparations for teaching HOTS during online learning have been made, but the implementation is still not maximum. Learning tools such as lesson plans, media and tools depend on the ability of the school and the teacher's proficiency in teaching. Implementation that is less than optimal cannot be separated from the constraints of online learning. There are at least five obstacles to practicing HOTS in online Biology learning, those are uneven student facilities, inadequate signals and quotas, uncontrollable conditions of students, lack of student learning motivation, and limited teacher skills in teaching HOTS. Besides that, there are four solutions used by Biology teachers to overcome these obstacles, which are taking a certain approach with students, holding additional study hours/meetings, preparing lesson materials in advance, and working with parents, homeroom teachers, and BK in control students. The learning model that is most often said to be suitable for practicing HOTS is the model PBL and PjBL.

Author Contributions

Aulia Hermawati Ulfah: writing-original draft preparation, result, discussion, methodology, conclusion; Heri Retnawati and Supahar: analysis, proofreading, review, and editing.

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Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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