SCIENCE TEACHERS INNOVATION IN OVERCOMING LEARNING CHALLENGES DURING PANDEMIC COVID-19: A REFLECTION

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Abstract: This study aimed to find out the challenges of online learning experienced by schools during the pandemic and explore information from the innovations it has carried out in science learning for students at Muhammadiyah junior high school 7 Cerme, Indonesia. Data collection in this study was carried out using interviews, observations, and documentation to identify challenges and innovations in online learning. The data obtained are challenges and innovations during online learning. These challenges include lack of teacher resources, difficulty monitoring teachers in the implementation of learning, difficulties in monitoring students in learning activities, low IT skills, more time in preparing for learning, lack of student motivation to learn, not having devices, and constrained by internet networks, and students lazy to study. The innovations are improving science and technology in learning and monitoring teacher learning through online journals and learning applications. Next, independent home visits of students, conducting training on the use of IT, using online learning media that are mastered by teachers and understood by students, preparing learning materials properly, and independently providing materials and assignments to students. The results of the reflection show that the implementation of online learning is still carried out even though it has limitations that lead to the emergence of several challenges from both teachers and students. Involvement between teachers and students needs to be maximized by improving teacher skills and student learning habits, which are the demands of the current technological era. So limited face-to-face learning is carried out, which combines face-to-face learning in class with online learning to reduce current challenges.

Keywords: *Online Learning, Challenges, Innovation, Science Teacher.*

INTRODUCTION

The COVID-19 (Coronavirus Disease 2019) pandemic has impacted the entire world population in various sectors of life, including in Indonesia. This virus has an impact on all sectors, one of which is the education sector. The education sector has undergone major changes due to the virus pandemic. Almost all educational institutions are experiencing an unprecedented change crisis during the COVID-19 pandemic [1]. Online learning has greatly affected schools, educators, and students. Problems arise mainly in the achievement gap between schools in underdeveloped areas and schools from regional backgrounds with technological advances. Problems arise mainly in the achievement gap between schools in disadvantaged areas and schools from regional backgrounds where there have been technological advances [2].

The current process of implementing distance learning causes learning loss in students [3]. This online learning has led to a decline in student learning outcomes, whose effect is equivalent to one-fifth of the school year, the same period that schools were closed at the time of COVID-19. This learning loss is dominated by less-educated homes students accounting for 60% of the average general student [4].

According to a survey from the SMRC institution, namely Saiful Munjani Research and Consulting, data results were obtained, explaining that as many as 92% of students faced obstacles when conducting online learning [5]. Obstacles experienced during online learning include the lack of students' understanding of the content of learning materials from teachers in online classes. This internet network is not smooth or experiencing disturbances, lack of mastery of online learning media that makes learning materials cannot be delivered properly. So, students feel very bored carrying out online learning [6].

Meanwhile, the learning process must continue even at home. Teachers are required to master learning facilities by utilizing online media [7]. Various research results examine the various challenges of online learning, one of which is the challenge of designing learning. Online learning expects students to be able to follow the learning to the maximum [8]. The effectiveness of online learning during COVID-19 depends on the learning media used, the readiness of academic resources, and the interaction between teachers and students [9]. Students feel that online learning is too difficult for them to understand. In addition, the lack of interaction between teachers and students in online classes and the lack of academic support media are the main reasons for disrupting the implementation of online learning.

Online learning teachers tend to give students tasks, so students become bored and depressed with the tasks given by the teacher [10]. The lack of teacher ability in technology is a challenge in the learning process. Not all teachers can do online learning, especially in the 80s

generation, due to a lack of literacy in computer technology and the Internet [11]. During the COVID-19 pandemic, teachers were suddenly forced to learn online [6]. The teacher is not enough just basic technological skills (such as using a computer and connecting to the Internet), but also knowledge for using recording devices and their software, as well as methods for delivering lessons without face-to-face interaction (interesting learning videos). These skills will be required when using an online learning platform [12].

Online learning is also one of the challenges for science subjects which are highlighted not only in cognitive aspects but also attitudes and skills of the science process [13]. The science score of students in offline learning is higher than that in online learning. [14]. Science learning provides direct knowledge to students to scientifically implement about the surrounding nature so that they can cultivate cognitive, psychomotor, and social thinking skills [15]. One example of an explanation that can give students such experiences is a demonstration.[15]. Thus, teachers are required to use online-based learning media that can help students in achieving science learning to achieve the desired. The ability of science teachers to bring innovations in online learning is necessary to overcome the challenges faced.

Online learning research during the COVID-19 period regarding learning challenges and innovations is still only on junior high school teachers of certain subjects. The implementation of online learning suddenly creates many obstacles [16]. Preparation for participating in and implementing online learning needs to be improved, especially in science learning. Hence, it is necessary to reflect on what to do in online learning during a pandemic. Reflection leads to activities to find out what happened, what challenges were experienced, and how innovations were carried out as an effort to reduce or overcome obstacles as an effort. Innovation is needed to foster student interest and attract students' attention to be active in online learning [17].

This study focuses on the reflection of innovation of Science Teachers at Muhammadiyah Junior high school 7 Cerme in Overcoming Learning Challenges During the COVID-19 Pandemic. With this research, it is hoped that it will be a reflection for teachers on how to deal with obstacles and problems in online learning. This study aims to discover the various challenges of online learning experienced by schools during the pandemic. In addition, this research also explores information from science teachers' innovations in science learning for students at Muhammadiyah Junior High Sool 7 Cerme so that an overview of online learning can be obtained during the pandemic and new normal.

RESEARCH METHODS

This research used descriptive research by providing an overview and explanation of the implementation of online science learning during the COVID-19 pandemic, starting from the challenges faced to the innovations provided in learning based on the results of interviews and observations. Participants in this study were determined by the purposive sampling technique. Purposive sampling was used with consideration in taking participant samples. This research was conducted at Muhammadiyah Junior High School 7 Cerme with informants, namely the principal, three science teachers, and ten students at Muhammadiyah Junior High School 7 Cerme consisting of 3 students in class VII, three students in class VIII, and four students in class IX.

Procedure

Data collection in this study was carried out using interviews, observations, and documentation carried out to find out the challenges and innovations of online learning. In the pre-field stage, observations and interviews were carried out with science teachers at school. The next stage is the research stage. This stage interviewed informants personally by asking questions related to the challenges and innovations of science teachers in online learning during the COVID-19 pandemic. The next stage is the teacher's observation by observing the activities carried out and the learning tools used.

Instruments

This interview used an open interview. The use of open interviews is to give some questions to the informants without limiting the informants to argue and not limiting them to answer yes or no. Research using open interviews is used to examine and understand the attitudes, views, feelings, and behaviors of individuals and groups [18]. In conducting interviews using interview guidelines that contain questions in the form of challenges faced and innovations carried out to make it easier and focus the questions that will be expressed to informants. The interview guide is only an outline of the problems that will be asked of the informants.

Data Analysis

Data collection was analyzed using Miles & Huberman analysis method with steps including data collection, data reduction, data presentation, and concluding [19]. Data collection was carried out during the study to obtain information related to science learning innovations during the COVID-19 pandemic under data collection techniques. Data reduction is processing the data obtained by selecting data for research and discarding unused data—the presentation of data

in the form of data descriptions of science learning innovations during the COVID-19 pandemic. The final stage concludes by summing up the entire data obtained by the researcher.

RESULTS AND DISCUSSION

Based on the results of data collection, through interviews and observations, as well as documentation, several online learning challenges were found in schools, science teachers, and students. This challenge is faced because of the transformation of face-to-face education into a digital form that occurs in schools. The results of research on the challenges of online science learning are shown in Table 1, and online learning innovations are shown in Table 2.

Science learning is carried out online under the emergency curriculum that the government has issued. Teachers need to synchronize the teaching materials used with the curriculum during the pandemic because every basic material or resource cannot be given all to students due to time and place constraints [20]. The material provided is only essential, so the implementation of online learning is easier. Meanwhile, material that is not so essential can be in the form of assignments for students. The use of an emergency curriculum aims to make the burden on teachers, students, and parents light on the online learning system [21]. TIt is supported by the results of an interview with the principal stated in the following sentence:

"We are using the emergency curriculum recommended by the School's District Education Office."
"For the provision of material only on certain essential materials, and I am responsible to the teachers of each subject teacher."

The learning process during the COVID-19 pandemic must continue even though the learning process is carried out at home. Learning innovation is a solution that needs to be designed and implemented by teachers by maximizing existing media, such as online media [22]. Teachers must be able to innovate

learning using online methods, which must take advantage of technology and information. Teachers conduct learning by using internet-connected devices to access the media to be used. Use of social media such as Whatsapp, Zoom, Google Classroom, Youtube, or other social media as a learning tool, can be used by teachers. It can be carried out anywhere and anytime, not limited to distance, and can be followed easily by all students.

The implementation of online learning is certainly not as optimal as face-to-face learning. Lack of teacher resources, facilities, and infrastructure are some factors that affect online learning [6]. Based on the results of the interview with the principal, which are stated in the following excerpts, namely:

"Some teachers are not used to online learning because the teacher's competence in IT abilities is lacking."
"Our school lacked science teachers at the beginning of the COVID-19 pandemic, which overwhelmed the learning process."

The lack of teacher resources makes teachers not accustomed to planning online learning, so they do not want to apply online learning optimally. It happened because of the 80s generation of teachers new to the world of technology and information [11]. Teachers of all backgrounds and ages should prepare and deliver their classes from home, with all the challenges faced and often without adequate technical support [23]. Based on the results of the interview with the principal stated in the following sentence:

"Schools make online journals; teachers fill out online journals so that the school can monitor the teacher's teaching activities. The school also monitors teachers through google classroom because our school does more learning activities through the application."

Table 1. Online Learning Challenges and Forms of Online Learning

No	Challenges	Form of Challenges
1	School	Lack of teacher resources
		Difficulty monitoring teachers in the implementation of learning
2	Science Teacher	Difficulty monitoring students in learning activities
		Low IT skills
		More time to prepare for learning
		Less student learning motivation
3	Student	Do not have a device (mobile phone, laptop, etc.)
		Constrained by internet networks
		Lazy to study

Table 2. Online Learning Innovation in the COVID-19 Pandemic

No	Challenges	Online Learning Innovation		
		School	Science Teacher	Student
1	Lack of teacher resources	Adding science teachers to increase teacher resources	Always improving Science and Technology and be applied to learning	Study with parents
2	Difficulty monitoring teachers in the implementation of learning	Procuring online journals and monitoring learning applications	Evaluating science learning carried out	Providing criticism and advice to teachers regarding science learners
3	Difficulty monitoring students in learning activities	Making independent visits to students' homes	Monitoring student activity using the Whatsapp chat application	Answering questions and discussions and collecting tasks at any time
4	Low IT skills	Conduct training on the use of IT media	Meetings and discussions between science teachers in educational forums	Learning to use online learning apps
5	More time to prepare for learning	Using essential learning materials guided by an emergency curriculum	Creating and using online learning media that are mastered, and teachers learn materials well	Self-study before getting science learning materials
6	Less student learning motivation	Providing guidance and support and facilitating the implementation of online learning	Designing interesting learning strategies, using interactive learning media for science learning that is easy for students to understand	Instilling in students that learning is important
7	Do not have a device (mobile phone, laptop, etc.)	Providing school computers for teachers to conduct online learning	Delivering materials and assignments independently to students' homes	Using a parent device

The school seeks to monitor teachers in online implementation by filling out online journals and monitoring online learning applications. Schools are also improving their facilities and infrastructure to maximize online learning to reduce and overcome the challenges faced. Initially, the implementation of school online learning was carried out through the virtual zoom application. Virtual face-to-face zoom of science subjects is only given one week with an allocation of 2 hours of study time. It is done not to burden teachers and students so that online learning is more effective. Effective online learning is influenced by several important factors, including principal leadership, information and transparency from the government, and the participation of parents and the community [24].

Indirectly, the ability to use and access technological media must be mastered by teachers and students. Teachers at the beginning of learning during the COVID-19 pandemic found it difficult to operate media devices due to a lack of capabilities in the IT field. It is supported by the results of the interview with the teacher, which is stated in the following sentence:

"My main challenge is actually operating a technological device with many various applications to learn."
"The previous generation of teachers had difficulty adapting to the current technological devices. We have to prepare more to carry out learning so that it takes more time to prepare for learning."

The online learning process is learning whose success will greatly influence the teacher's ability to use technology in delivering learning materials [25]. The ability to use information technology is a challenge in online learning and must be mastered by teachers to facilitate the learning process during the COVID-19 pandemic [26]. It is supported by the results of the interview

with the teacher, which is stated in the following sentence:

"Online learning has a positive effect because it can open up opportunities for practicing and using online devices."

According to teachers, the existence of online learning can also improve the ability of teachers to use information technology to face technological developments in the world of education. Online learning is a technological development characteristic of 21st-century education which is also a revolution 4.0 [19].

Teachers also need to guide students in using social media and not to mention that some students do not have cellphones, laptops, or computers and are constrained by signals[16]. It happens because only parents have cellphones or lack economic level owned by parents. It is supported by the results of interviews with students stated in the following sentences:

"At first, it was difficult to use the application provided by the school, but it also adapted quickly anyway."
"Every morning, parents are reminded if there are learning activities that are not and assisted by parents if I feel troubled."

Parents of students are confused and think their child will never go to school again, and teachers are concerned about what to do next, especially since they are well aware of their lack of technological literacy skills [27]. Parents can only remind children and help students to participate in learning during the COVID-19 pandemic. Based on the results of the interview with the principal stated in the sentence below, namely:

"Some students don't have mobile phones when studying online."
"It is difficult to monitor students in learning. Students sometimes collect assignments late and do not give a response when given a question."

It is under the results of interviews with science teachers, namely:

"At a certain time, the school comes to the students' homes to make visits to be able to carry out learning. I also had tutoring at my house."
"The principal visited the home of a student who was constrained by devices and networks. So that we can provide materials and assignments for students with these obstacles."

Teachers make independent visits to students' homes to monitor student learning. With this visit, teachers can review student learning activities and student complaints about online learning to the teacher. Teachers must be able to ensure that online teaching and learning activities run smoothly, even though there are limitations in their implementation [28].

Teachers' ability to develop learning tools during the COVID-19 pandemic also needs to be improved. The policy of changing from offline to online makes teachers have to think hard about developing learning tools. Creative, professional, and fun teachers must have skills in developing effective media and learning evaluation [29]. In online learning, you can do several things, namely communicating with each other and discussing online [30]. According to the results of the interview with the teacher, namely:

"We prepare science learning using Canva-based science modules and material powerpoints. Sometimes, it also uses learning videos uploaded through Google Classroom and Youtube and online-based Student Worksheets."

The teacher considers using these media very effective by making students not lazy to learn, to increase student learning motivation. Students will find learning valuable when it makes learning motivation appear and increase. Motivation is in control of learning because it encourages a person to carry out the learning process due to changing conditions, thus achieving the goal, namely the learning goal [31]. Students can organize the knowledge gained in the learning process, with the process of learning and thinking making it easy to memorize knowledge [32]. Students can organize the knowledge gained in the learning process, with the process of learning and thinking making it easy to memorize knowledge [33].

Teachers need much more time to plan the online learning process than offline learning. Teachers were not familiar with preparing online learning tools at first. Based on the results of the interview with the principal, namely:

"The school had training with speakers from outside the school and our teachers."
"These trainings are in the form of creating learning media that can motivate students' learning."

It is supported by the results of interviews with teachers, namely:

"Greatly helped by the training provided by the school."
"Sometimes we discuss with regional education forums and science teacher forums to share about creating interesting learning media for students."

Teachers receive training from schools and educational forums on how to prepare and operate

technology-based learning tools. During the COVID-19 pandemic, teachers are ready to conduct online learning by preparing learning tools (Syllabus, Learning Implementation Design, and Student Worksheets) and learning media to be used. But it is also necessary to improve some indicators such as network improvement, skills in IT, online learning planning, as well as the ability of teachers to use LMS applications for online learning [16].

The needs of teachers to meet the demands of technological developments in the world of education require training support and learning assistance. With training programs, teachers can create learning tools that appeal to students. Engaging learning aims to motivate students to understand the content of the learning material studied [34]. According to students, which is stated in the following sentences:

"The assignment is more on the material, nor can you understand the material given because there is something that is not the same as the student's book."
"Often browse through Google to find materials you don't understand."
"Studying online for too long, to the point of making you lazy to study."

Students in online learning feel bored quickly. This teacher creates learning that is not boring by using different learning strategies. After the teacher masters the online learning media tools, critical thinking will be created to design the learning methods and models that will be used. These results will be more varied and allow students to get out of the zone of boredom for online learning.

Google Classroom is one of the most used media by science teachers in schools in online learning. According to teachers, Google Classroom can be used for discussions and questions and answers when conducting online learning. Teachers also use Google Classroom to upload teaching materials such as e-modules, powerpoints, and learning videos from Canva and give students worksheets based on Liveworksheet. The teacher said that the Google Classroom application is fairly complete because many features are already available. But there is also a downside, namely the need to use a large enough data package to access it. Internet constraints are a high percentage of online learning challenges such as student self-study, home conditions, and interaction between teachers and students [35].

The selection of teaching materials during online learning is an effort to increase student learning motivation. In online learning, teachers must create interesting and meaningful learning activities to foster student motivation [36]. Based on the results of the interview with the teacher stated in the sentence, namely:

"Making learning videos on materials such as measurements (class VII) so that students do not quickly feel bored in online learning activities."

The selection of learning videos can provide opportunities for students to interact to increase understanding. Science learning will be more meaningful if it is carried out through discovery, experimentation, or direct student experience [14]. Teachers must figure out how to make science learning understandable to students by making videos. Teachers also use online-based student worksheet media by using Liveworksheets. It is supported by the results of interviews with teachers, namely:

"When the material requires experimentation, use Liveworksheet media that can be accessed directly by students and groups."

Student Worksheets based on Liveworksheets can increase mental activity such as making observations and investigations, and the independence of students looking for information in working on Student Worksheets. So that students have high self-confidence, their curiosity of students increases [37]. According to the teacher, using Liveworksheets can make it easier for students to fill in the activity results and answer questions using the device. Students can also directly see the results of the work done on the Liveworksheet. Liveworksheet-based Student Worksheets can improve student learning outcomes with students' enthusiasm, confidence, and independence in the learning process, critical and diligence [38].

Implementing online learning during the COVID-19 pandemic is still carried out under limited conditions. The positive side of online learning is to train the skills of teachers and students in the 4.0-century era, which can be used at any time other than learning in the classroom. The disadvantages of online learning, namely the lack of optimal involvement of students in learning activities and the skills of teachers, still need to be improved. The government issued a Limited Face-to-Face Learning policy which is carried out with limited meeting time and is combined with online learning. The school carries out limited face-to-face learning according to the recommended rules by carrying out the learning process in the classroom. The delivery of material is only essential and the provision of practice questions, while in online learning, teachers continue to use innovative learning methods and learning media. Limited face-to-face learning can support the delivery of concrete material to students. It impacts student learning activities and the learning outcomes of students' science which are in the sufficient category [39]. Science learning must

occur as a process where students are involved in learning. Students will experience the process of thinking about things in the real world in learning so that they are presented with problems that students must solve through their observation or research and looking for answers on their own. [40]. Thus, limited face-to-face learning that is carried out can restore learning activities and discussions between teachers and students in the classroom.

CONCLUSION

The challenges of online learning from schools include the lack of teacher resources and difficulty monitoring teachers in implementing learning. Science teachers face difficulties monitoring students in learning activities, have low IT skills, and require more time to prepare for learning and generate student learning motivation. From the student side, not having devices such as (cellphones, laptops, etc.) is constrained by internet problems and laziness to study. The results of the reflection showed that the implementation of online learning was still carried out even though it had limitations which caused several challenges for both teacher and student schools. The involvement between teachers and students needs to be maximized by improving teacher skills and student learning habits, which are the demands of today's technological era. Science learning must occur as a process where students are involved in learning. So limited face-to-face learning is carried out that combines face-to-face learning in the classroom with online learning to reduce current challenges.

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