[JPSP] Submission Acknowledgement

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Susilo Susilo:

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Synchronous Teaching Classes During the COVID-19 Pandemic: A Narrative Study of Indonesian Science Teacher's Experience

Abstract

Due to the COVID-19 pandemic, Indonesia, like most other countries, has suspended face-to-face learning activities for two semesters. Teachers face the challenge of adapting to a long rotation of online learning. This article narratively investigates the teacher's first experience of changing learning implementation by examining how Synchronous education was implemented in Indonesian schools during the lockdown. We analyzed the tools used and the crucial factors (school support, student engagement, and teacher readiness) and their expectations of leaders during the online learning process. According to the findings, most teachers struggle to determine effective learning strategies due to a lack of technological knowledge. Due to uneven infrastructure support in Indonesia, network issues become a significant issue during the process. Understanding information and communication technology (ICT) as a teacher is critical for online learning. The ongoing training policy is emphasized in order to shape professional teacher development in the future.

Keyword: *online learning, professional teacher development, synchronous, training policy*

Introduction

For more than a year, most schools worldwide have been locking down and transitioning to online (remote) methods due to the COVID-19 pandemic (König, Jäger-Biela, & Glutsch, 2020; Murphy, 2020). UNESCO reports the learning activities of more than 1.5 billion students from 165 countries affected by the pandemic (Osman, 2020). In both synchronous and asynchronous, online learning in Hong Kong is conducted for an entire semester in spring (Moorhouse, 2020). In

Australia, school closures are in place from March 24, 2020 (Scull, Phillips, Sharma, & Garnier, 2020) and diverted to hybrid schooling. Similarly, in Indonesia, the lockdown policy makes education providers change their learning system (Purwanto et al., 2020). Teachers face significant new challenges to adapt to online learning (König et al., 2020).

Due to the influence of the Coronavirus pandemic situation since the beginning of 2020, distance learning has become a dominating and exciting research topic for research (Clark, Nong, Zhu, & Zhu, 2020; König et al., 2020). Many studies support the application and development of online learning. The online learning model provides more educational opportunities for all students (Abuhammad, 2020; Aldosemani, 2020). The survey results show that students are satisfied with the online learning experience in general (Jogezai et al., 2021; Osman, 2020; Scull et al., 2020). In science learning, the implementation is very familiar with observation activities and laboratory-based experiments. Integrating science learning with real-world information-based and communication technology keeps students motivated and confident (Braund & Reiss, 2006). Dyrberg et al. (2017) explain that the utilization of Labster virtual laboratories can realize interactive learning, increase confidence and pre-laboratory readiness of students majoring in pharmaceutical toxicology. Other applications such as Edmodo are also proven to increase the participation of secondary school students in biology learning (Permana & Chamisijatin, 2019).

In fact, not all online learning operations are successful (Shi, Tong, & Long, 2021). Although student participation is high, they are less motivated if they are not directly involved in the learning process. (Dyrberg et al., 2017). On the other hand, Teachers struggle to balance cognitive, psychomotor, and affective aspects of synchronous and asynchronous learning. In practice, synchronous learning allows teachers and students to collaborate on material resources such as text, video, web browsing, and digital whiteboards. A synchronous environment allows students

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and teachers to collaborate in virtual classrooms without geographical barriers. Synchronous environments have long been used in learning due to their ease and flexibility (A. N. Chen, Wang, Chen, & Wang, 2008; N.-S. Chen & Ko, 2010; Shahabadi & Uplane, 2015; Wang, Chen, & Levy, 2010). Synchronous activities do resemble face-to-face in physical classrooms but require complex learning activities due to their complexity (Meskill & Anthony, 2014). While synchronous classes provide advanced virtual face-to-face features, we believe they have drawbacks.

Evidence of both the positive and negative effects of online learning on teachers and students has been reported across various subjects and regions. Otherwise, the results have been inconsistent and varied, indicating that more research is needed in this area. As far as we know, there has been little coverage of an in-depth investigation of science teachers' experiences with implementing online learning in Indonesia. This study discusses how high school science teachers in Indonesia perceive after teaching in a synchronous environment for a year due to the COVID-19 pandemic. The findings of this study are expected to be used as a consideration by high education system developers and policymakers in countries experiencing similar problems.

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- In Indonesia
- Science teacher
- COVID-19

Literature Review

Online Mode Learning Transformation

The teaching and learning process is generally a group of students gathered in a classroom according to the schedule and listen to formal explanations from the teacher. In these circumstances, the use of ICT can be said to be still limited (Fraillon, Ainley, Schulz, Friedman, & Gebhardt, 2014; Weiser, Blau, & Eshet-Alkalai, 2018). On the other hand, adaptation to online mode learning has also been implemented by some countries. They apply blended learning to support the face-to-face process and mediate assessment of students' involvement in learning

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activities (Bower, Dalgarno, Kennedy, Lee, & Kenney, 2015; Ferdiansyah, Supiastutik, & Angin, 2020). Recently, the transition of learning activities to virtual happened unexpectedly quickly and had a significant impact. Of course, this has a positive influence on the development of the education system, expanding ICT transformation (McFarlane, 2019). Nowadays, ICT integrated curriculum is a concern for the international education system. The need to prepare students in societies where digital literacy plays an essential role in life is becoming increasingly high (König et al., 2020).

The lockdown policy forces teachers and students to turn to online learning, providing a different experience. According to research, the majority of students are quite capable of engaging in digital-based learning. In contrast, competency development in teachers runs slower (Aslan & Zhu, 2015). Outside of instructional purposes, teachers are also asked to maintain communication with students. This encourages teachers to utilize various tools and resources to implement new approaches to teaching and improve digitalization by institutions. This unique situation makes the characteristics gained from regular teacher professionalization programs less applicable. Therefore, training teachers to apply technology in teaching is required (Amhag, Hellström, & Stigmar, 2019; Zydney, Warner, & Angelone, 2020). The determining factor of teacher professionalism in combining technology in learning lies in the teacher's perception of technology. It is expected that teachers have an open attitude and are willing to learn to be fully involved in adopting ICT integrated education (Van der Spoel, Noroozi, Schuurink, & van Ginkel, 2020).

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"According to Aslan and Zhu (2015), the majority…"

Online Learning Gap

The shift in learning in a short time certainly poses its challenges for students and teachers. A teacher must be adaptive and remap learning strategies that support students' learning

interactions and motivations (Bennett & Lockyer, 2004). In addition, the short transition period also revives the urgency of teacher professionalism in terms of digitalization of learning that has been the concern of international educational institutions for a long time (Van der Spoel et al., 2020). As Purwanto et al. (2020) state, the current situation encourages teachers to improve their skills in technology. Online learning can also provide a more flexible and adequate time for teachers to complete their tasks. In another statement, it was found that this learning can mediate learners to construct their learning autonomy (De Paepe, Zhu, & Depryck, 2018).

The effectiveness of online learning can be considered through several factors, including methods used, the interaction of educators with students, and assessments conducted (Caskurlu, Richardson, Maeda, & Kozan, 2021; Dyment, Downing, Hill, & Smith, 2018; Kim & Lee, 2011). The availability of technical facilities and how many opportunities teachers have to develop their digital competencies also often show significant influence (Diningrat, Nindya, & Salwa, 2020; König et al., 2020). At least two problem points can be concluded in implementing online learning, namely activities that become centred on teachers and gaps in the interaction between teachers and students that are increasingly widespread due to technical constraints (Buchanan, 2019; Moorhouse, 2020). While in Indonesia itself, the real problem is the limitation of infrastructure caused by different geographical conditions, making some areas difficult to reach. Education in isolated areas becomes crucial because it is prone to 'lose' a generation due to learning difficulties during the pandemic (Permana & Chamisijatin, 2019). This means that while the application of online learning is quite promising, the negative impact that arises becomes a challenge that must be sought solutions.

Synchronous Integrated Learning

Education in the digital age often exposes educators and students to complex problems, encouraging a collaborative solution search process. Most of these problems can be solved through the application of technology in pedagogy that eventually succeeds in improving educational prospects (N. S. Chen, Ko, Kinshuk, & Lin, 2005). Today, interactions are no longer limited to face-to-face meetings but can be done online, which is the most critical component of learning. As reported by Anderson (2003); and Bernard et al. (2009) that there are three types of interactions in education, namely interactions: (1) student-instructors, (2) between students, and (3) student-content materials. Online interaction modes can be categorized into asynchronous and synchronous. Asynchronous learning allows interactions to occur at different times, with media correspondence and written discussions. At the same time, synchronous learning requires both parties to interact directly at the same time (real-time) in the teaching and learning process, through video conferencing or chat rooms (N. S. Chen et al., 2005; Stewart, Harlow, & DeBacco, 2011).

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The increasing prevalent application of online learning is in line with the many studies that uncover the topic and its benefits. Integrated synchronous learning can provide broader educational access and a more inclusive learning experience for geographically isolated students (Bower et al., 2015; Cunningham, 2014). This method also allows students to experience instructional learning with the opportunity to discuss and comment on classroom dialogues similar to conventional learning experiences (Bower et al., 2015; Stewart et al., 2011; White, Ramirez, Smith, & Plonowski, 2010). Video conferencing, commonly used in synchronous learning, can overcome communication challenges and affective assessments, as in its interactions can show dynamic body language and discussion rather than reflective written responses (Stewart et al., 2011).

Despite its potential, there are still challenges and problems in implementing integrated synchronous learning. Technical skills and platform usage adaptation are among the biggest

challenges for both instructors and students (Bower et al., 2015; Cunningham, 2014; White et al., 2010). The amount of internet bandwidth should also be noted to ensure smooth communication and not hampered or disconnected. Connectivity difficulties can have a significant impact on synchronous learning (Vu & Fadde, 2013).

Method

This study adopts a narrative inquiry approach mainly used as a legitimate means of research in social, linguistic, and cultural analysis (Barkhuizen, 2013; Ho, Chow, Chiang, Wong, & Chow, 2019; Mendieta & Barkhuizen, 2020). In education, a narrative approach can describe various phenomena that tell the story of his journey as an educator (Tannehill, 2016; Trahar, 2008). It is the most appropriate means of describing what teachers know, what they do, and how they teach in a sociocultural context (Clandinin & Connelly, 1987; Conle, 2001; Golombek & Johnson, 2004).

In the context of online learning, narrative approaches can dig deeper into teachers' experiences who are changing the way they teach (Clandinin, Murphy, Huber, & Orr, 2009; Johnson & Golombek, 2002). The transition of regular learning modes to virtual can bring new experiences and dynamic perceptions to related individuals. In this study, semi-structured interviews were used to obtain information regarding participants' backgrounds, academic experiences, and views on synchronous learning conducted over two semesters. Interviews in the study allowed researchers to unearth information about participants' activities, experiences, and opinions in their language (Brinkmann & Kvale, 2018).

Participants

The participants are Indonesian science teachers who have used synchronous learning. For its collection, the convenience sampling technique was used. Participants and the college's ethics

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"…teachers need training for ICT integrated teaching, especially for science teachers who need to assess aspects of students' practical skills"

So I guess they may have recruited science teaches due to their need to assess knowledge transfer to the real world. Nevertheless, the instruments used in this study did not reflect the characteristics of science teaching or knowledge transfer.

committee carry out and approve ethical procedures. Protection of participants' privacy to maintain research ethics, the complete identity of participants is disguised as done by (Hammersley & Traianou, 2012). The purpose of the research is determined before entering any data. Participants were informed that they could only provide information if they agreed to participate in the research.

Furthermore, 47 teachers from various schools were involved to fill out an online questionnaire sent via email. Twenty-two people agreed to be interviewed over the phone to explain and confirm the story they submitted. The interview is recorded and then transcripted with the participant's permission. The characteristics gained as a result of the whole vary. When the age range, level of education, and type of online learning platform used are considered, the distribution is fairly even. Table 1 contains a detailed description of the participants' characteristics.

Table 1.

Demographics of Participants

Variable		Frequency	Sample Percentage (%)	Modus
Gender	Male (1)	9	19.1	
	Women (2)	38	80.9	2
Age	21-30 year (1)	13	27.7	
	31-40 year (2)	6	12.8	
	41-50 year (3)	19	40.4	3
	51-60 year (4)	9	19.1	
Education Level	Undergraduate (1)	24	51.1	1
	Magister (2)	23	48.9	

Frequently used Platforms	Email (1)	21	14.4	
	Whatsapp (2)	38	26	2
	Facebook (3)	1	0.7	
	Youtube (4)	21	14.4	
	Zoom (5)	26	17.8	
	Schoology (6)	2	1.4	
	Edmodo (7)	4	2.7	
	Quipper (8)	2	1.4	
	Edpuzzle (9)	2	1.4	
	Quizizz (10)	2	1.4	
	Google Form (11)	1	0.7	
	Google Meet (12)	14	9.6	
	Google Classroom (13)	8	5.5	
	Cisco Webex (14)	1	0.7	
	Udemy (15)	2	1.4	
	Padlet (16)	1	0.7	

Instruments

As a result of the COVID-19 pandemic situation, digital instruments were developed to avoid face-to-face meetings. The online assessment is prepared in two main sections, namely: (1) questions about the specific characteristics of each participant, and (2) several open questions for three categories, namely the condition of activities during synchronous learning, the role of agencies in supporting online learning, and learning expectations after the COVID-19 pandemic.

Following up on the survey results from (König et al., 2020) and instrument development from (Jäger-Biela, Kaspar, & König, 2020), this narrative assessment is focused on the teacher's reaction to this change. Data was gathered on the platforms used, the platform's disadvantages and advantages, and the constraints encountered to get a better picture of synchronous learning. Question items are presented in Table 2. This digital instrument results from modification of the previous research instrument (Ferdiansyah et al., 2020; König et al., 2020; Purwanto et al., 2020).

Table 2.

Questionnaire Instruments

Indikator	Item
Learning conditions during the COVID-19 pandemic	1. What are the advantages of the online learning platform that you use during the learning process? 2. What are the obstacles encountered during the online learning process? 3. During online learning, how is the interaction between educators and students? 4. How is student participation during the online learning process? 5. In your view, what are the shortcomings or weaknesses of online learning? 6. In your view, what are the advantages or advantages of online learning?

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- How is teaching different in the COVID-19 time compared to before? This question is important because, as the authors earlier stated, very limited literature covers online teaching in Indonesia.
- What are the unique needs and barriers of teaching science entirely online in Indonesia?
- In line with the literature review, how well does the current infrastructure support teacher-student, student-student, and student-material interaction? How well does the infrastructure support synchronous and asynchronous learning?

The role of the agency as a support for online learning	7. How does your agency support online learning?
Learning expectations after the COVID-19 pandemic	8. What is your view on online learning going forward? 9. When the COVID-19 pandemic in Indonesia ends, will online learning still be done? 10. Will current online learning affect the curriculum going forward?

Data Collection and Analysis

The narrative data of the interview results are listened to repeatedly and then copied into a table format for easy identification and classification. To facilitate transcription, the data is classified into 1) the conditions of learning activities during the COVID-19 pandemic; 2) the role of agencies as supporting online learning; 3) learning expectations after the COVID-19 pandemic. Participants were allowed to check the transcript of the interview results (member checking) so that the validity of data (data trustworthiness) and ethics in data construction before entering the analysis stage (Harvey, Robinson, & Welch, 2017).

A qualitative hermeneutic analysis is used to analyze questionnaire and interview data, including reduction, display, conclusion drawing, and verification. This technique aims to interpret and comprehend the meaning of a narrative text (Hashimov, 2015). Detailed analysis procedure as stated by (Ferdiansyah et al., 2020; Widodo, 2014) terdiri dari:

1. Re-listen to semi-structured interview results with participants to find key points and keep the study's theme in mind.

2. Create table-formatted transcripts of interview results to aid in the coding and categorization of critical data.
3. Interpret data by interpreting each participant's word and or sentence.
4. Provide transcripts of interview data to data sources, namely participants, to obtain feedback on data interpretation results.

Findings and discussions

This study describes the perception of science teachers in Indonesia towards online learning as a result of the COVID-19 pandemic through three themes of findings, including (1) the conditions faced by science teachers in carrying out online learning; (2) the role of the institution in which science teachers teach to support online learning; and (3) online learning expectations after the COVID-19 pandemic

Conditions Science Teachers Face in Online Learning

Online learning implemented during the pandemic became a new experience for participants and others involved. The implementation of the ideal media is needed, where various online learning platforms are easier to reach Today. According to Li & Ma (2010), ICT-based learning tools can be categorized into two, namely: tutorials (used for direct-teaching) and communication media (used for collaborative learning). This pandemic period is an opportunity for teachers to increase attention directed at developing and utilizing online learning media. Most participants used WhatsApp messaging app for asynchronous learning and Zoom meeting for synchronous learning based on the interview results.

"WhatsApp is a convenient and effective way to reach all of my students because it is easily accessible and widely used. Furthermore, the cost of internet data is relatively low." -MS

"The delivery of materials that need face-to-face and discussion usually uses Zoom because it is comfortable to use." -AFH

Efforts to use online learning media have been made, but participants and students often complain about the effectiveness and efficiency of online learning that is not maximized due to obstacles from various factors. Here is an excerpt of the interview delivered by the participants.

"I find it difficult to make accurate and authentic assessments of students. Similarly, the preparation of learning media. Probably because of my lack of mastery of technology." -LEN

"The biggest obstacle in this online method is, of course, in terms of signal and package data internet. If students run out of non-package data, then they cannot follow the learning." -IAR

"Each student's financial limitations are what hinder online learning. Not all students have communication tools (gadgets or smartphones) to learn." -NH

In general, the answer to the question of online learning constraints in this study is similar to that reported by Ferdiansyah et al. (2020), that barriers are dominated by internet connection until it finally impacts the absence and loss of student learning opportunities. Thus, it is recommended for educators to help their students deal with this crisis by providing easier-to-reach learning. One of them is switching to a more cost-effective application that best suits each student group (Raaper & Brown, 2020).

While it is hard to control an entire student, various ways are still being taken to build interaction. Because with the dialogue between teachers and students, the exchange of ideas and opportunities to deepen the understanding of learning materials can be created (Harrison, Harrison, Robinson, & Rawlings, 2018). The response was quite varied; the participants in the interview stated it.

> The important apperception activity to be maximized is saying hello to build personal closeness and enthusiasm for students' learning. Because this all starts from the creativity of educators and stakeholders. -FS

> The delivery of materials is done through Zoom and continued with the assignment through WhatsApp groups. Question and answer are also usually done in WhatsApp groups or can chat privately. Sometimes I reward students who follow the learning well, such as sending credit/internet quota. -LE

> "The interview excerpt indicates a good pattern of interaction between educators and students. Nevertheless, not a few participants also stated that online learning is less interactive."

> The class is quite active at the beginning of synchronous, but the more days the interaction is only one-way from teacher to the student only. Many feel saturated with this online learning pattern, so they are no longer enthusiastic about learning. -AJ

> "Sometimes it is difficult to communicate due to different student backgrounds." -SA

> "Fostering student involvement in synchronous learning situations is a challenge in itself. The feedback from students is so minimal that I think it is necessary to update the learning strategy that is more student-centred." -IAR

According to Diningrat et al. (2020), the focus of the next issue after connectivity issues is the best way to increase student engagement by designing more student-centred learning. The exposure of interview results regarding educators' interactions with students can be investigated further regarding how much participation students have in learning.

The findings showed that 53.2% of participants rated the students as always active, 31.9% thought only a few students were enthusiastic while the rest more often turned off the camera or sound during synchronous learning, while another 14.9% said most of the students were less active in education. Some argue that satisfied students are financially disadvantaged students. Generally, underprivileged students do not have a conducive learning environment and no complete learning support system (Kim & Lee, 2011; Ray, Bala, Chakraborty, & Dasgupta, 2021; Yu & Webb, 2019). The results were obtained based on the results of the participants' interviews.

> "The majority of students in my class are very enthusiastic about synchronous learning. It could be the main factor because students are more familiar with the technology. So they are comfortable with this learning pattern." -NS

> "Students' learning spirit goes up and down. Approximately 70% of students are active; the rest are silent and do not even participate." -ANF

> "For me, student participation is less than the maximum because not all students can participate in learning because of carrying capacity limitations." -NH

As is commonly assumed, this online learning experience demonstrates that students' digital skill levels appear to outstrip those of most teachers. Nonetheless, what must be prioritized is the development of motivation and a spirit of learning in each individual.

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-These citations from the participants are not in line with the literature citations in the previous paragraph.
- Using the narrative inquiry method, the authors should tell some stories of the participants so that we understand the context of the statements.

The Role of Agencies to Support the Implementation of Online Learning

Activities in online learning from a teacher's perspective include integrating ICT in online teaching and assessment. Adaptive and optimistic nature in achieving learning objectives in each specific situation is needed to build the competence of educators (König et al., 2020). In this case, in addition to each teacher's internal factors, the agency's role is also very influential. Digital literacy is the main prerequisite for educators to teach in online classes, so the need for ICT training organized by institutions instructionally becomes an inevitability (Osman, 2020). Based on the results of interviews with participants, most institutions support the implementation of online learning. Among the practices is to provide quota assistance for teachers and students and always inform the development of online learning, as presented in the following interviews.

> "Teachers are prepared for online learning with Google Suite for Education training. This is an efficient implementation as things become more integrated." -WN

> "The school gives appreciation to students and teachers in the form of internet quota assistance of Rp100,000/month." -FS

> "The agency's support is very satisfactory. We, teachers, are supported by internet quotas and given the flexibility to move in the curriculum so that learning can be flexible." -NH

After nearly a year of online learning, the perception of online learning is undeniably established. Various points of view can then be used to evaluate future implementation. As a result, this study delves deeper into teachers' proclivity to conduct online learning following the pandemic.

Online Learning Expectations After the COVID-19 Pandemic

Participants' responses can be classified into three groups: expressing full support, notes, and not supporting. The following are the results of interviews with participants who support and are likely to continue to carry out online learning post-pandemic (44.7%).

> "Synchronous learning is a form of adaptation to the development of dynamic and fast-paced science and technology. Educators are encouraged to improve their competence." -FS

> "Can reduce time and distance limits so that learning is more effective and efficient." -AC

> "Online learning can be an alternative solution when hands-on learning cannot be done. Students are also excited because technology is significantly related to the daily life of millennials." -IS

Some participants also supported online learning by accompanying the reason (36.2%) as in the following interview excerpt.

> "Inevitably we have to be ready with the learning of this online method. Nevertheless, it needs improvement for the future based on the experience that has happened." -AJ

> "For the implementation of online classes later, hopefully, the provision of facilities is further improved. Training is held for teachers not to stutter, and socialization for parents/parents to form cooperation." -NDP

> "Online classes can be implemented as regular class supporters according to their proportions and needs." -AEP

> "Most likely still implemented but not the main one. The form of learning will be hybrid with offline learning (blended learning). However, face-to-face needs to be done." -TG

On the other hand, 19.1% of participants who disapproved or tended to return to offline learning in full included the following reasons.

> "I am still more comfortable with hands-on learning because synchronous methods make it challenging to deliver complex material. When students have difficulty understanding the lesson, it will be easy to feel saturated and give up." -NH

> "Many teachers and students are in connection-constrained areas, making it increasingly challenging to access lessons." -SA

In terms of flexibility and adaptability, synchronous learning is a real challenge for education around the world. The challenge elicited a wide range of responses. Following their firsthand experience with this learning method, participants were asked for their thoughts on its shortcomings and benefits. The following are some of the flaws that have been identified.

> "Less supportive for practicum. Moments of firsthand experience become lost, and the further impact of students' competence in working in the laboratory is reduced." -AFH

> "There is no psychological touch or emotional interaction with students, especially with passive students becoming increasingly challenging to reach." -NN

> "Assessments for affective and psychomotor realms are difficult to ascertain their accuracy. Since we do not know exactly what students are doing, the most important thing is honesty." -SM

Assessment of students' performance and attitudes in an online environment is still an obstacle for teachers, especially in practical competencies. It is therefore important to look for different types of alternative assessment methods that are more relevant. In addition to the various shortcomings felt, the transition of this form of learning also has a positive impact. One of them is as an agent of change in education, especially for classical institutions that have rejected change (Osman, 2020). Like the following interview excerpt.

> "The positive is more encouraged to improve skills in the ICT field. Indirectly also optimize the functionality of gadgets that I have." -ML
>
> "Number one is more flexible. Accessible anywhere, relaxing, and time-saving." -LM
>
> "Getting students' assignments and learning outcomes is easier." -ER

However significant the proportion of online learning implementation will undoubtedly affect the curriculum in the future. The normalization of emergency distance learning will eventually not only be known as a preventive measure of the pandemic and become an alternative form of learning but will be more widely implemented to change the educational landscape (Osman, 2020; Shelley, Murphy, & White, 2013). Reflection of the learning experience over the last ten months needs to be done so that educational institutions are better prepared in the face of the possibility of extension of the emergency online learning period and forms of mixed learning. In line with the statement, participants also expressed views on how this method would affect the curriculum in future interviews.

"ICT integration in the learning process will undoubtedly affect the curriculum in the future. However, the curriculum can not be carried out 100% because it still takes time for adaptation. Often the target of educational achievement is not met." -AFH

Yes, because information technology affects the learning process. Learning will be able to take place without the attachment of space and time. For example, a student can complete assignments and discussions with their teacher through an online class. The flexibility of online learning will affect the content of a curriculum that has been dense and very burdensome for teachers and students. -NN

"The experience that has been felt is suitable as a material to improve online learning later." -AC

Conclusion

The purpose of this study was to investigate science teachers' attitudes toward synchronous learning during the Indonesian lockdown. This is because educators are more aware of potential learning situations and understand the impact of using technology. Furthermore, educators play a significant role in determining the outcomes of learning activities. As a result, this study focuses on gathering statements related to the conditions experienced by teachers during the synchronous learning process, including its benefits and challenges and the hope for better future implementation. The findings revealed that teachers experienced both the positive and negative aspects of the transition to virtual learning. Synchronous learning provides only intrinsic visual feedback that tends to harm learning. Pedagogical protocols are challenging to implement with synchronous learning systems. Therefore, network infrastructure constraints allow speech during learning, as evidenced by previous research (Pagnotta, Laland, & Coco, 2020).

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Commented [ZZ15]: I guess the authors intended to say "network infrastructure should allow speech during learning"?

Nevertheless, in the end, it can be concluded that most teachers support the application of hybrid schooling in the learning system in the future, with the record of making some improvements to facilitate adaptation and meet learning achievements. Empirically, this research contributes to considering an ideal online learning application or medium to use. In addition, theoretically, this research states that teachers need training for ICT integrated teaching, especially for science teachers who need to assess aspects of students' practical skills. Another factor that also affects the effectiveness of online learning is the condition of the network. This study has not been revealed the extent of the impact of technical constraints on learning outcomes. It is expected that other researchers can compare the percentage of internet access between countries and how it affects the country's educational status. In closing, integrated synchronous learning offers students benefits in terms of flexibility, but technological and pedagogical knowledge challenges challenge implementing this approach.

Commented [ZZ16]: I don't think this conclusion contribute much to the field. We all know there isn't an "ideal" ICT solution.

Commented [ZZ17]: If this is the reason for this study to recruit science teachers, it should appear in the Participants section. In addition, the questionnaire/interview questions should be more tailored to science teaching.

Disclosure statement

The authors reported no potential conflict of interest.

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