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1 M. IRFAN, CH. W. SURYANINGRUM, W. PUSPORINI, SRI A. WIDODO

Online learning effect of post pandemic COVID-19: a survey at universities in Indonesian

The problem and the aim of the study. WHO has determined that COVID-19 is a pandemic, because it has become epidemic in all corners of the world. The effect of the spread of this pandemic, learning must change from the habits that have been done so far, such as learning is done online using several platforms as learning media. For more than two years, COVID-19 has been declared a pandemic, although until now signs of the spread of COVID-19 have decreased, but who has not lowered the level from pandemic to endemic. For more than two years the learning was also conducted online, causing many problems for students.

2 **The purpose of this study** is to evaluate the implementation of online learning that has been carried out during the two years of the COVID pandemic.

Three parts are examined in this study, namely the obstacles faced by students when carrying out online learning, student strategies to overcome these obstacles, and how students expect online learning to continue.

2 **Research methods.** This research is qualitative research with the type of case study. Respondents in this study were 795 students in Indonesia. The instrument used in this study was 12 open questions which were divided into 5 parts, namely: respondent's identity, confirmation that the university had implemented online learning, obstacles faced by students, solutions made by students, and student expectations. This instrument is given online via a Google Forms. The data that has been obtained, then grouped into 4 groups with the help of Nvivo, then interpreted and described by the researcher.

5 **Results.** The results showed that 83% experienced problems when online learning was implemented during the COVID-19 pandemic that hit Indonesia for 2 years. The majority of obstacles faced by students include inadequate internet network, equipment used, high internet quota, communication methods, too many assignments, and difficulty understanding the material presented.

4 **In conclusion,** the implementation of online learning, students experience various obstacles. It was recorded that of 795 respondents, there were 83% experienced problems when implementing online learning. The majority of obstacles faced by students include inadequate internet network, equipment used, high internet quota, communication methods, too many assignments, and difficulty understanding the material presented.

Keywords: online learning, post-pandemic, COVID-19, universities

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Introduction

WHO has determined that COVID-19 is a pandemic, because it has become epidemic in all corners of the world [1]. Globally, as of 5:39pm CEST, 23 September 2022, there have been 611,421,786 confirmed cases of COVID-19, including 6,512,438 deaths, reported to WHO. As of 19 September 2022, a total of 12,640,866,343 vaccine doses have been administered [2]. For more than two years, COVID-19 has been declared a pandemic, although until now signs of the spread of COVID-19 have decreased, but who has not lowered the level from pandemic to endemic [3]. The effect of the spread of this pandemic, learning must change from the habits that have been done so far, such as learning is done online using several platforms as learning media [4].

The technological revolution and the increasing amount of information available on the internet have forced most institutions and educators to face digital transformation [5; 6]. As well as the learning methods used by teachers, they must also begin to change to face this era [7]. In addition, teacher is required to provide appropriate access and training, because technology is not only a complement to learning [8]. Learning is usually done face-to-face with the presence of teachers and students in one place and at the same time, have to change to distance learning by using several platforms such as zoom, google meet, and other video conferencing platforms, or use the learning management system to perform asynchronous learning [9; 10]. In future orientation, learning will be more for technology integration and open access by anyone and anywhere. Learning in the future will be based on e-learning [11; 12], and gamification is used for learning [13; 14]. Because e-learning-based learning uses gamification in theory and can build skills and achieve proficiency; help apply learning to certain jobs, and Affect behavior change (on long-term implementation). In addition, the use of digital technology in learning continues to increase [15]. In the last two years, the pandemic due to the Coronavirus Disease 2019 (COVID-19) has hit the world and forced the world of education to change the way of learning [16], including in Indonesia which confirmed the first case of COVID-19 in March 2020 [17]. Forced and with short preparations, Education has changed from offline learning to online, so there is a high demand for fulfilling online learning [18; 19].

With access restrictions in schools and colleges, learning has shifted from a face-to-face approach to online teaching [20]. Even some schools that are well-established and strong in terms of capital, use hybrid learning, which combines face-to-face learning as well as online learning. Online learning transcends time, location, and cultural boundaries and has created many opportunities for both students and teachers [21]. Students can learn anytime, anywhere, regardless of gender, age, geographic location, and culture [22]. Learners want to take advantage of the flexibility of online learning, so they can pursue their educational goals while off campus [23; 24].

Today, online learning has some advantages over face-to-face teaching. Especially in the current state of the COVID-19 pandemic, online learning is still the only alternative solution that can be used for learning [25; 26]. Online learning is the priority of choice for educators for classroom learning during the pandemic especially in Romania [27], Jordan [28], Indonesia [29], and other countries affected by the COVID pandemic. Ideally,

online learning can still interact between teachers and students [30; 31]. The interaction process can be in the form of asynchronous communication, as can be done on Google Classroom [29; 32], Moodle platforms [33], and LMS-Google Classroom with Problem Based Learning [34]. This way allows them to communicate and get feedback quickly, which makes learning more interesting and more collaborative. Interaction is an effective factor of successful online teaching [35], interactions that occur in online learning can be used as a benchmark that the media used (both synchronous and asynchronous) for online learning is easily understood by students or not when the teacher delivers the material [36; 37]. In addition, online teaching is more accessible, so students can access up-to-date information and resources [20]. They can also review course materials, choose content formats, and acquire new knowledge and skills. Furthermore, online teaching, through technology and communication, provides an opportunity to increase students' independence and intelligence [38; 39] and can also move on their own [39; 40].

But in reality, in the field, the application of online learning raises various problems such as (1) the uneven condition of the internet in Indonesia [41; 42], (2) the inability of parents to provide adequate facilities so that online learning can be carried out properly such as quotas and smartphones [43], (3) the loss of learning as a result of teachers not being able to assess and distinguish students who are competent or not yet competent [44; 45]. This is exacerbated by the existence of a pandemic that implements online learning that seems forced. Previous research has stated that some courses (e.g., algebra, calculus, analysis, programming) are very difficult when it comes to online learning [20], students experience serious obstacles when learning online, but teachers do not experience significant obstacles when learning online [46]. In addition, it was also found that problems that became less common in the industrial revolution 4.0 and social 5.0 era such as weak IT mastery, limited student interaction, students in the form of inactivity in learning, limited supporting facilities and internet network access, while from parents in the form of limited time in accompanying child during online learning [47; 48].

Based on this description, it is interesting for researchers to conduct a survey on online learning during a pandemic. This is important to do to evaluate the implementation of online learning during the two-year pandemic. It is hoped that this explanation can provide an overview of various obstacles and recommendations for online learning in the future. Thus, it is necessary to examine the various obstacles faced by students when implementing online learning, how students' strategies to overcome these obstacles, and what students' expectations are if online learning continues.

2 Methods

This research is qualitative research with the type of case study. A case study is research that is used to find or investigate problems in depth about an individual, group, institution, social movement, or event, related to the phenomenon, context, and time [49; 50]. This study aims to evaluate distance learning activities in the COVID-19 pandemic era. Specifically, three parts need to be explored. First, the obstacles faced by students when implementing online learning. Second, student strategies to overcome these obstacles. Third, what students' expectations are if online learning continues? This research cannot

help in making decisions or arriving at a conclusion (generalization) [51]. However, this research can provide recommendations and descriptions²³ regarding the conditions of online learning from the perspective of students in Indonesia.

Respondents in this study were 795 students spread throughout Indonesia, both public and private campuses. This is because researchers cannot control from whom and from the respondent's home university. Thus, the respondents in this study were taken randomly, with a population of all students in Indonesia. The researcher only limits and ensures that the subjects used in this study are students of mathematics education or mathematics in Indonesia. Researchers do not limit whether they come from public or private universities, the age of the respondents, the period of study, and gender. In this study, researchers certainly experienced limitations in taking respondents, because the distribution of questionnaires was limited using various online media such as WhatsApp groups, social media, and broadcast messages. This is different from research that has been done, namely by using mathematics teachers as respondents and they are categorized based on years of service, gender, and also certification [46].

The instrument in this study adopted a research instrument [20] and was developed by researchers and discussed in group discussion forums conducted online using the help of zoom. This research instrument consists of 12 questions which are divided into 5 parts, namely: respondent's identity, confirmation that the university has implemented online learning, obstacles faced by students, solutions made by students, and student expectations. These questions require open answers, thus providing an opportunity for respondents to express their broadest opinion without coercion and intimidation.

³⁴Data was collected using an online survey via a Google Forms. Online surveys are used for reasons of flexibility, compatibility with researchers' online work during the pandemic and of course student activities. In addition, online surveys are easy to access and manage using a variety of devices [52; 53]. The survey was distributed after going through the evaluation process of the results of the Online FGD involving 5 experts from 4 universities in Indonesia. Furthermore, the online survey was disseminated through WhatsApp groups, email, and also social media in April 2022. Google forms were chosen by researchers to create online surveys because of their ease of use. After the respondent fills out the survey, the respondent will get a recapitulation of the results. The data were further grouped into 4 groups with the help of NVivo. The data obtained were then interpreted and described by the researcher.

Research results

¹⁴This study aims to evaluate the implementation of online learning during the two-year pandemic. This survey research was conducted using google form and distributed in all study programs of mathematics and mathematics education (hereinafter used for mathematics) in Indonesia. The results of this survey provide an overview of various obstacles and recommendations for⁶ online learning in the future. Thus, it is necessary to examine the various obstacles faced by students when implementing online learning, how students' strategies to overcome these obstacles, and what students' expectations are if³² online learning continues.

Based on the survey results, it was found that as many as 83.5% of mathematics study program students had difficulty learning online during the pandemic, while the rest did not experience learning difficulties. Most students who experience obstacles use several strategies to overcome these obstacles (see Table 1).

Table 1

Category of Student Strategy

Strategy category	Number of respondents
Looking for internet signal (include free Wi-Fi, change provider of the internet)	212
Ask lecturers, friends, and seniors	170
Self-study (reading, YouTube, Exercise)	254
Save money on internet quota needs	95

Based on Table 1, many students (254 respondents) choose to study independently through YouTube, learning recordings, reading materials, and exercises. This happens because many of the respondents are in the status of new students and have never met students in their class. So, it is quite difficult when you have to ask friends or lecturers.

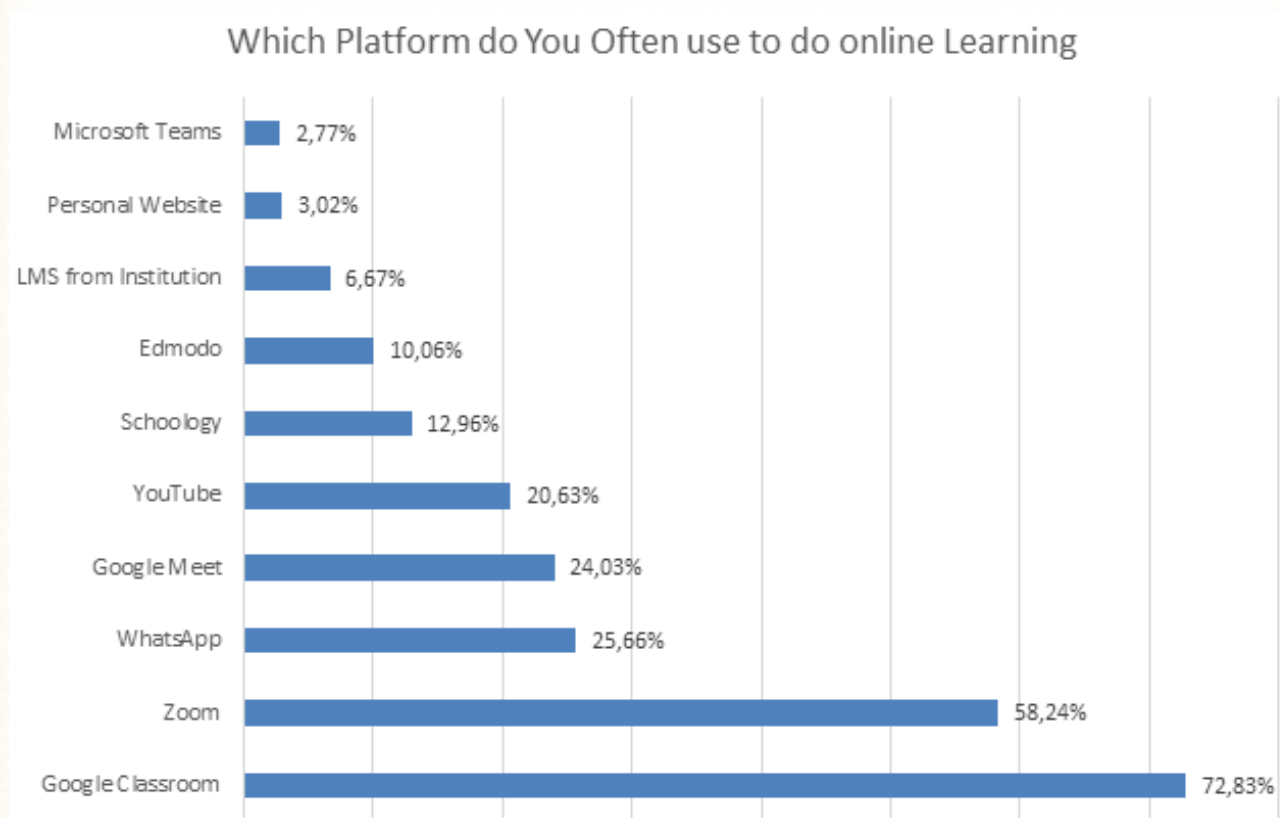


Figure 2 The platform used during the pandemic and the easiest to use

Figure 2 shows ten (10) platforms that students often use for distance learning during the COVID pandemic. Based on this survey, Indonesia still dominates the use of Google classroom for learning during the pandemic (see Figure 2). For video conferencing platforms, the zoom platform dominates use during online learning during the COVID pandemic (see Figure 2).

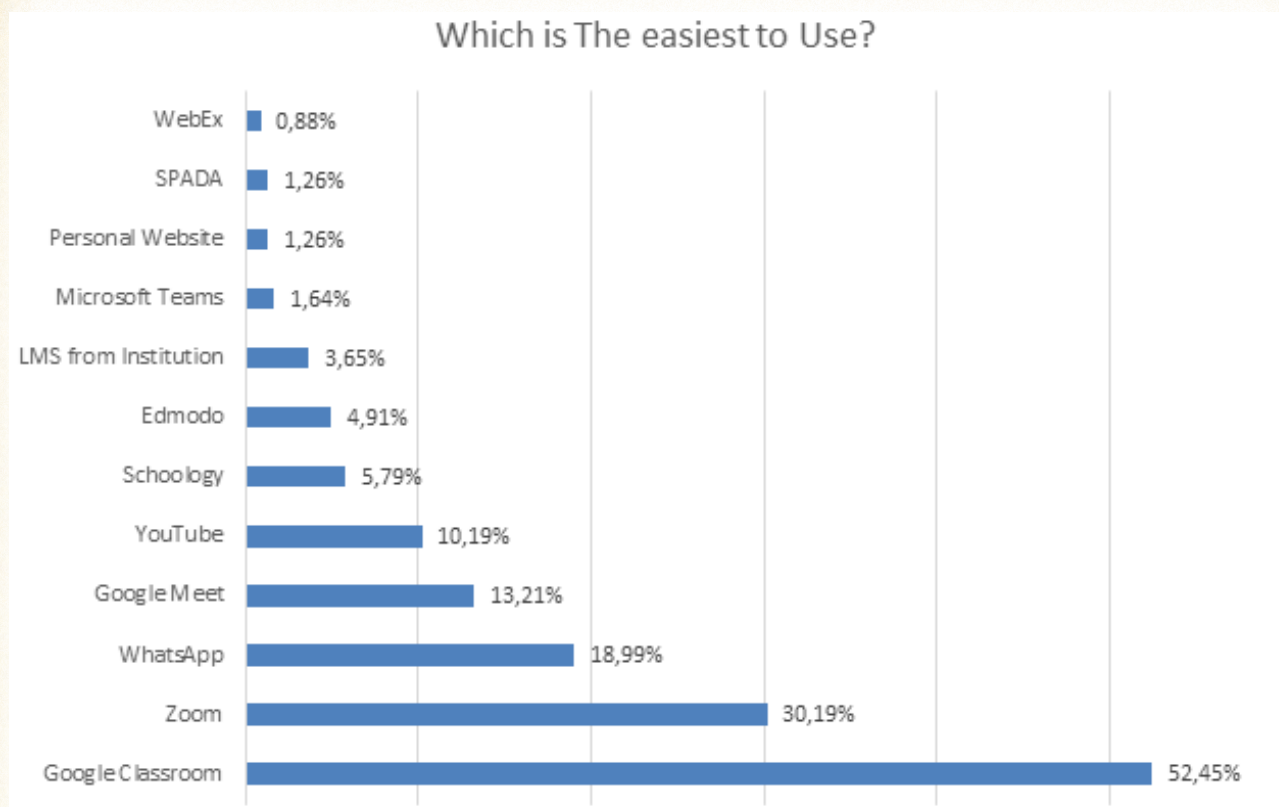


Figure 3 The platform used during the pandemic and the easiest to use

The survey results related to the expectations of using the platform during distance learning. The results of the survey on expectations of using the platform for distance learning during COVID-19 pandemic include: Google Classroom, Zoom, WhatsApp, Google Meet, YouTube, Schoology, Edmodo, etc. (see figure 3). From Figure 3, the Google Classroom and Zoom platforms. These two platforms dominate the survey results due to their ease of use and complete features.

Constraints Faced by Students with the Implementation of Online Learning

With the implementation of online learning, of course, teaching and learning activities have changed. In Indonesia, starting from March 15-24 2020, there have been 20,000 online classes that have been created by teachers, with a total of 8,683 teachers from 4,492 schools across Indonesia who registered through the Quipper School application [50]. This happened because of the impact of School from Home during the Pandemic. However, the surge in online learning users is not all happy with the application of online learning. In this study, from 795 respondents 663 respondents experienced problems when applying online learning. From 663 respondents, there were various kinds of obstacles, such as internet networks, limited communication, and difficulty understanding the material.

Internet Network

The internet network has become a primary need during this pandemic. This is because almost all educational institutions carry out the School from a Home appeal, which results in soaring internet needs. Based on internet traffic data, there was a 73% year-on-year growth in the first quarter of 2020 and a 139% increase in the second quarter. In fact, online traffic

growth accelerated in the second quarter with a 46% quarter-on-quarter increase in 2020 compared to a 5% quarterly increase in 2019 [55]. However, behind the increasing use of the internet, there are still many areas that are still experiencing problems with the internet network, some of which do not even have an internet network. From 795 respondents, 517 respondents have problems with the internet (see Figure 1), some even have to travel 3-6 hours to access the internet. This is following data from the Ministry of Communication and Information which states that 1,175 sub-districts do not yet have internet access [56; 57].

In addition to the uneven internet network, another problem is the price of the internet quota. The price of the internet quota is still considered expensive in some circles of society. Among the respondents, stated that "I have to buy internet packages 2-3x a month, which is equivalent to around 50Gb. Even though I usually only need 10GB a month." This problem has been responded to by the Ministry of Education and Culture with the help of quotas for students, students, teachers, and lecturers. However, limited access is also a problem.

Limited in Communication and Difficult to Understand the Material

10 During the pandemic, all educational institutions carry out online learning. According to the survey conducted, as many as 574 respondents used google classroom for online learning and as many as 432 respondents gave reasons for using google classroom because of its convenience (see Figure 2).

12 This is following the main goal of Google Classroom, which is to streamline the process of sharing files between teachers and students. Many respondents use Google Classroom because of the limited internet signal and the devices used. It should be noted that in Indonesia, the internet is not evenly distributed to remote areas. For students who are in the city, of course, online learning using video conferencing can be easy, but this does not apply to students who live in remote areas. To access the internet requires a trip of up to 6 hours. The limitations of the platforms and devices used to result in limited communication between teachers and students. Many respondents complained that it was difficult to understand the material explained through video conferencing because the voice was not fluent and only presentation slides. Respondents better understand the material if it is delivered through offline classes because lecturers can write on the blackboard various proofs and mathematical calculations.

The same thing was also conveyed by respondents who were studying computer programming (mathematics study program). It is difficult to understand computer programming because in the area it is difficult to find a legal license which hinders practice. It's different when you are in the campus computer laboratory, which has been facilitated by computers and software for practice. If there is a problem, you can directly ask the lecturer and answer it right away.

Student Strategies to Overcome the Problem

41 Based on the description of the problems faced by students during online learning, students have various strategies to overcome problems. Of the 795 respondents, 64 respondents did not give their opinion. This is because they do not have significant problems during online learning. However, as many as 731 respondents gave their opinion. This shows that during online learning, many students have problems. In this survey, students are free

to write their opinions according to their experiences. The researchers then classified them into 4 categories, namely looking for internet signals, asking others, self-study, and frugality (see Table 1).

Student Hope

Online learning can still run even though the pandemic has subsided. In general, students view online learning as going well, although most students feel that their academic needs are not being met. Online learning has its advantages and disadvantages. One of the advantages of online learning that students feel during a pandemic is flexibility. Students can learn from anywhere and do not need much preparation. However, on the other hand, there are many obstacles faced, namely signal quality, lack of interaction, a large number of tasks, uncertain schedule, no practicum, and high costs.

From the survey results, there were various student responses. However, most of them said that the duration of the video conference was shortened (about 40 minutes) which could then be added with independent assignments. In addition, some of them also think that the assignments should not be too many and lectures are on schedule. This makes them work multitasking. This is in line with previous research which stated that students multitask and have problems focusing [58]. During online learning, students are also involved in non-academic activities such as doing daily tasks, looking through social media, driving, and even watching movies [59; 60]. Students also often work on assignments in other subjects during synchronous learning, perhaps because of the excessive number of assignments [61]. This lack of focus and commitment certainly requires a strategy from the lecturer. Quizzes at the end of the session can be a strategy to maintain students' cognitive presence [62].

Overall, online learning during a pandemic has had various impacts, both positive and negative. However, data obtained using NVivo, shows that several open-ended questions in the survey show negative aspects, as presented in Table 2.

Table 2

Summary of Results the Answers to Open Questions in a Survey Using NVivo

Question	A	B	C	D
What do you hope for in the future if online learning is still applied?	6	3	2	0
Are you happy with the application of this online learning Give a reason!	0	3	4	0
How do you try to overcome these obstacles	0	9	1	0
If yes, please state what obstacles you encountered!	1	10	1	0

Note: A: Very negative; B: Moderately negative; C: Moderately positive; D: Very positive

Discussion

The survey results show that Google Classroom and Zoom dominate the results of this survey. Lecturers usually use Google Classroom for asynchronous sessions as a substitute for the learning management system developed by educational institutions, in this case, universities. In addition, for synchronous sessions involving interaction between lecturers and students (although it is done virtually), the zoom platform dominates in online learning.

The results of this study did not change much from the results of a survey conducted at the beginning of the pandemic which showed that LMS developed by universities were less attractive to lecturers for online learning during the pandemic, they preferred to use Google Classroom and Zoom for online learning during the COVID-19 pandemic [20].

In the previous section, it was written that this study aims to describe the obstacles faced by students with the implementation of online learning, student strategies to overcome these problems, and student expectations if online learning is still implemented. Therefore, the author will present the results of the research in three parts, namely: obstacles faced by students, strategies to resolve obstacles, and expectations of future learning.

In the section on learning barriers faced by students during the pandemic, the survey results showed that most of them were due to an unstable internet network. This result is in line with the results of previous research which states that a poor internet network, no internet quota or not having sufficient data packages make it difficult for students to learn [62; 63]. This condition in Indonesia, turns out to be in line with research conducted in Turkey that there are not a few teachers who do not understand information and communication technology, unstable internet connections, inability to access the internet, weak infrastructure, and lack of ability to use communication and information technology [64; 65]. Likewise in Saudi Arabia, previous research stated that teachers sometimes cannot connect effectively, because sometimes the internet is bad and the network sometimes interferes [67].

The Indonesian government, through the Ministry of Communications and Information Technology, admits that the condition of the internet in Indonesia is not evenly distributed in all regions [56; 57], so that the problem of an unstable internet network becomes a problem of e-learning learning for now and in the future. As long as the government has not leveled the condition of the internet in Indonesia, the problem of an unstable internet network becomes a serious problem if Indonesia wants to implement e-learning. This is because e-learning without being supported by adequate internet access is impossible to carry out properly and effectively. This is in line with the results of previous research which stated that e-learning learning during the COVID-19 pandemic in Malaysia which stated that most students were not ready for online learning because the main challenge faced was low internet access to allow them to study online [67; 68].

In addition to unstable and uneven internet network access, limited interaction and communication during e-learning during the pandemic made it difficult for students to understand the material taught by the teacher. Whereas the results of previous research have shown that e-learning can be effective if learning utilizes information and communication technology optimally in the learning process as a means of learning [69]. Likewise with e-learning learning during a pandemic, at least three things must be done by teachers, namely (1) the teacher's role as a learning facilitator to facilitate learning, (2) designing interesting learning, and (3) designing alternative teaching tools such as Internet-based devices and other electronic media, so that e-learning during a pandemic can be studied effectively [70].

The limited interaction in e-learning learning can occur due to unstable and uneven internet network access, so that the e-learning learning process is often interrupted by video conferencing that freezes. As a result, the conference activities carried out cannot

be carried out smoothly, the laptop must be restarted if you want to continue the learning activities. As revealed by one of the research subjects used by Akhter (2020) stated that teachers are sometimes less able to connect effectively, because sometimes the internet is bad and the network sometimes interferes [66]. For this reason, e-learning conducted during the pandemic can take advantage of synchronous and asynchronous sessions [29; 32]. Synchronous sessions use platforms such as Google Meet or Zoom, while asynchronous sessions can use LMS platforms that have been developed by universities or use Google Classroom. This is in line with previous research which states that synchronous activities using video conferencing are used for practical learning, while asynchronous learning using LMS is used for theoretical learning, so that the cost of e-learning is cheaper [31; 71].

The results of this study showed that most of the respondents in Indonesia experienced problems in distance learning during the pandemic. This result is in line with previous research which stated that during the pandemic teachers in Turkey experienced difficulties in internet access and lack of infrastructure, classroom management and human resources [64]. Likewise in America who complain about insufficient resources, not ready to provide learning opportunities for students, and not all children have internet access at home [72]. Although this condition is different from the application of modular learning carried out in rural and marginalized areas in the Philippines [73]. Almost every country has complained about the problematic e-learning during the COVID-19 pandemic. Although in the Philippines it was reported that there were no problems, they still reported that there were obstacles from the parental factor because they had faced various learning challenges, delivery of instructions; unsatisfactory learning outcomes; financial difficulties while working for the family during the lockdown; struggling with the use and availability of technology; and personal problems on health, stress, and learning styles [73; 74]. It was also reported that the COVID-19 pandemic that hit the Philippines had the greatest impact on the quality of the learning experience and the mental health of students [75].

the results of the survey, grouped into 4 strategies used by students to overcome e-learning problems during the pandemic. The four strategies are looking for internet signals, asking other people, self-study, and saving on quota purchases. This strategy is almost the same as that done by students in Turkey, namely by seeking help from friends, family members, including parents. It can be said that participants are not generally not ready for the e-learning process imposed as a result of the COVID-19 pandemic. This is because there is no optimal technology support and e-learning training, participants do not have sufficient knowledge and experience about distance education, and what is equally important is that students have not been able to learn independently by looking for material from the surrounding environment including from the internet.

37 Conclusion

Based on the results and discussions that have been described previously, it can be concluded that during the implementation of online learning, students experience various obstacles. It was recorded that of 795 respondents, there were 83% experienced problems when implementing online learning. The majority of obstacles faced by students include inadequate internet network, equipment used, high internet quota, communication

methods, too many assignments, and difficulty understanding the material presented. With these various obstacles, students try to overcome the problem by looking for free Wi-Fi, choosing a cheap provider with a good signal, improving written communication, and discussing with friends via WA. From these obstacles, students have hope if online learning is still applied, namely: learning can also be made in the form of projects and does not always have to be face-to-face digitally, the availability of cheap and affordable data packages and networks for us who are in remote areas, lecturers are not too giving a lot of assignments with little time, there is an online learning system that can combine a learning management system and video conferencing.

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Information about the authors

Muhammad Irfan

(Indonesia, Yogyakarta)
 Assistant Professor, Department of Mathematics
 Education
 Universitas Sarjanawiyata Tamansiswa
 E-mail: muhammad.irfan@ustjogja.ac.id
 ORCID ID: 0000-0001-7003-2946

Christine W. Suryaningrum

(Indonesia, Jember)
 Assistant Professor, Department of Mathematics
 Education
 Universitas Muhammadiyah Jember
 E-mail: christine.wulandari@unmuhjember.ac.id
 ORCID ID: 0000-0002-2004-5981

Widowati Pusporini

(Indonesia, Yogyakarta)
 Assistant Professor, Department of Educational
 Research and Evaluation, Universitas Sarjanawiyata
 Tamansiswa
 E-mail: w.pusporini@ustjogja.ac.id
 ORCID ID: 0000-0001-9069-4293

Sri Adi Widodo*

(Indonesia, Yogyakarta)
 Assistant Professor, Department of Mathematics
 Education
 Universitas Sarjanawiyata Tamansiswa
 *Corresponding author
 E-mail: sriadi@ustjogja.ac.id
 ORCID ID: 0000-0001-8906-5190

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