

Students' Perception of Online Mathematics Learning During Pandemic COVID-19

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Abstract

The purpose of this study was to find out the perceptions of Information Technology students at UniSHAMS on the implementation of online Mathematics learning conducted in the era of the Covid-19 pandemic. The study involved 34 students from Diploma in Information Technology and Bachelor of Information Technology. This study is a quantitative study that uses a survey method—a questionnaire form used as a research instrument to obtain students' perceptions about online Mathematics learning. The findings of the survey study are divided into two parts: the availability of reliable digital and internet devices and students' perceptions of online Mathematics learning. Therefore, online learning is the most appropriate method to ensure that students do not miss out on learning no matter where they are. However, suppose the government, institutions of higher learning, academicians, and students take responsibility for

improving the existing weaknesses. In that case, this online learning will attract students to learn in online mode, especially Mathematics.

Keywords: *Perception; Online Mathematics Learning*

Introduction

COVID-19 is an epidemic that has spread from Wuhan, China, to other countries since 2019. It was declared a world pandemic in March 2020 (WHO, 2020) because it is highly contagious and more aggressive than influenza (Liu et al., 2020). Beginning January 2020, one COVID-19 case has entered Malaysia. Then, the cases increased day by day. As a result, the Prime Minister of Malaysia had to announce the Movement Control Order (MCO) whole of Malaysia starting on 18 March 2020 to curb the increase in the spread of this pandemic. In line with the announcement of the MCO, the whole country has closed all sectors, including the education sector. To stop the spread of the pandemic, various sectors, including education, were shut down, including all schools and institutes of higher learning. As a result, during the MCO, the face-to-face teaching and learning process, conducted since ancient times, had to be halted. This halts impact students, faculty, and organizations severely nationwide (Gallani, 2020).

Face-to-face classroom learning has been replaced with a wholly online approach to teaching and learning (Ishak & Mir Ahmad Taalat, 2020). Due to the pandemic, the online method has revolutionized the educational scene, particularly in teaching and learning. Although the world has become sophisticated with various software and digital devices, academicians still use the traditional method because they refuse to take the time to develop their 21st-century learning resources (Mohd Rusdin & Ali, 2019). Students are still not fully prepared for online learning (Ishak & Mir Ahmad Taalat, 2020). This situation will exacerbate when students are still less confident (Norasyikin & Isa, 2017).

Academicians began to exploit the opportunity of conducting classes online to ensure that no students missed out on learning (Hairia'an & Dzainudin, 2020). However, various annoyances arose as a surprise to students and academicians who had to fully implement online learning activities (Salleh et al., 2021). Some students, for example, do not have gadgets, do not have sufficient internet data, and do not have direct online access (Husin, 2021). As a result, students cannot download teaching materials due to low internet access or running out of internet data (Mohamad, 2021). Academics are conflicted on whether the platform is best for doing online learning. As a result, most of them employ the trial-and-error method to test the suitability of any medium.

To reduce the impact of the pandemic on the teaching and learning process in schools or institutions of higher learning, the Malaysian government has taken steps to implement fully online classes. The online course is an effort to ensure that all students do not miss out on learning. Therefore, the teaching and learning process has changed from face to face in the

classroom to the method of teaching and learning online based on technology such as learning portals, websites, YouTube, video conferencing, mobile applications, and so on is a drastic change that affects education around the world (Kuppusamy & Norman, 2021). This technology platform allows instructors to carry out teaching activities as usual without gathering them in class (Yusoff et al., 2021).

Problem Statement

Online learning is a challenge that students have to go through during this era of the COVID-19 pandemic. Not only students, lecturers, and institutions also face the same challenges in implementing online learning.

The author will detail these challenges in general terms faced by students of higher learning institutions in Malaysia. The problems of this study are divided into two main issues: device availability and internet accessibility.

Among the main components of online learning is the availability of digital devices. Online learning will not be balanced if the students or academicians do not own the main components, which is digital devices. According to a Ministry of Education Malaysia study in 2020, 36.9 percent of students do not have any digital device (Azman, 2020). The lack of digital devices among students will disrupt online learning, and this problem needs to be given prime attention so that the learning development plan becomes more effective and efficient.

The second problem encountered was internet accessibility in their homes. Students of higher education institutions come from various corners of the settlement area, whether living in urban or rural areas. This internet accessibility problem often occurs when online classes are being conducted. The study (Kamaruzuki, 2021) states that reports from SKMM and OpenSignal show that internet speeds are inconsistent and depend on the location of a place. In addition, internet speed data still has service quality issues, including in urban areas. Therefore, this is a big challenge for students to undergo online learning because of having good internet access problems.

There are several student perceptions of online learning. (Husin, 2021) divides two aspects of students' perceptions, namely the positive aspects and the negative aspects. Among the positive aspects listed in online learning is that learning is more flexible, saves time, and can quickly and easily access resources. However, the negative aspects listed in online learning are from other sides, such as internet problems, undisciplined students, an uncondusive environment, and a lack of skills in handling technology.

According to (Hasmuddin & Maat, 2020) review of several recent studies, online learning is more effective and attract students' attention during the learning process. In addition, online learning can also increase students' understanding while learning, increasing student motivation.

However, some students are not ready to choose other than traditional learning methods. In addition, prolonged online learning will cause students to lose focus when online classes.

Therefore, according to Salleh et al. (2021), the factors that influence students' perceptions of online learning depend on several factors such as accessibility, course content, use of delivery methods, and evaluation criteria.

Literature Review

Online Learning

Online learning is access to the learning experience through multiple technologies, connectivity, flexibility, and the capacity to foster various interactions (Moore et al., 2011). According to Makhtar et al. (2021), online learning is divided into two types: synchronous and asynchronous. These two types require the use of various kinds of devices that have internet access. Online teaching can be done synchronously. Teaching involves using technology platforms that can be used directly, such as Skype, Google Hangout, Google Meet, YouTube Live, Facebook Live, and Zoom Meeting.

In contrast, asynchronous teaching refers to learning interactions that occur without the need for an academician and students attend simultaneously through the use of Google Classroom, YouTube, Gmail, Facebook, Twitter, Microsoft Teams, Schoology, Padlet, and Edmodo (Yusoff et al., 2021). An essential element to consider is the need for students to master computer and internet technology to ensure the continuity of online learning (Yusoff et al., 2021). Therefore, an essential element of online learning is the internet and computer technology skills, whether synchronously or asynchronously.

This online learning has advantages and disadvantages for academicians and students. According to Salleh et al. (2021), the success of this method depends on several factors such as accessibility, course content, use of delivery methods, and evaluation criteria. In addition, creative, critical, and innovative minds can be formed through technology and online learning (Hashim et al., 2020). Furthermore, online education is more flexible because learning materials are more easily accessible, regardless of time and boundaries. It even has various exciting reference sources in multimedia and graphics (Mailis et al., 2020). Thus, this online learning can produce students who have creative, critical, and innovative minds. In addition, this online learning can save time and attract students because students can access learning materials quickly, and there are various exciting reference sources.

Online learning also has limits and constraints, such as issues with internet access, inadequate internet connectivity, internet connection quality, and students' lack of mastery of digital tool abilities (Salleh et al., 2021). According to (Husin, 2021), about 66 percent of students thought

the problem of the Internet line is a primary factor for online learning disorders. In addition, the findings (Mohamad, 2021) show that the challenges faced by students. For example, burdened to buy internet data, the environment is not conducive to learning, and the absence of electronic devices. Students find it challenging to keep up with online learning because of this difficulty. Thus, online education has limitations such as internet access problems, lack of mastery of digital devices, a lack of a conducive learning environment, and the absence of electronic devices. This limitation can cause students' motivation to learn to decrease, which will adversely affect learning achievement.

Online Mathematics Learning

Based on the experience of Mustapah and Rosli (2021), during the process of teaching and learning mathematics synchronously, most students who attend classes online do not open the video and turn off the voice (mute) during the teaching and learning process is underway. Synchronous learning is also one of the causes of students' tiredness because too long to focus on electronic devices where the teacher has set the learning period.

Mathematics is a complex subject, and mathematics contents are challenging to explain through online learning (Hasmuddin & Maat, 2020). Nevertheless, the implementation of technology in teaching and learning Mathematics helps students and academicians to perform calculations with better methods, analyze data and increase opportunities to explore mathematical concepts. It, in turn, results in effective learning in Mathematics (Hasmuddin & Maat, 2020). Moreover, online learning makes students feel that Mathematics is more fun and interactive than regular learning practices (Drigas & Pappas, 2015). Furthermore, content design with various graphics and interactive facilities makes complex algebra learning easier to understand (Akugizibwe & Ahn, 2020). Although education is advanced with technology, it cannot be overcome with the needs of teachers in their learning (Hasmuddin & Maat, 2020). Thus, although Mathematics is an abstract and challenging course, if online Mathematics learning is combined with exciting multimedia elements, it will attract students to learn and improve student performance.

Despite the advantages found in learning Mathematics online, there are also disadvantages to it. According to Panteli and Panaoura (2020), the implementation of online Mathematics learning received negative feedback when students were stressed because they were not willing to use other learning methods. Moreover, high-performing students in Mathematics argue that learning using mobile phones is inaccurate compared to the traditional way categorized as real learning (Panteli & Panaoura, 2020). In an unexpected pandemic situation, all parties, including students, should accept this situation better prepared to face online learning methods. Although learning is traditionally more effective, students need to embrace online education in this era of the COVID-19 pandemic.

Methodology

The main objective of this study was to investigate students' perceptions of online Mathematics learning. This study was conducted using quantitative analysis through a descriptive survey. Refer to Table 1; respondents were selected from 34 students consisting of 16 male and 18 female students. Referring to Table 2 below, ten respondents out of 34 students are students from the Diploma in Information Technology program. Meanwhile, 24 respondents out of 34 students are students from the Bachelor of Information Technology program. All respondents have undergone online Mathematics course learning at Universiti Islam Antarabangsa Sultan Abdul Halim Mu'adzam Shah (UniSHAMS) in the 2020/June semester. This study used a questionnaire as a tool to analyze the online learning process of students about Mathematics. This questionnaire is given after the students have undergone learning for 16 weeks of study for one semester. A statistical package for social science (SPSS) application was used to code, record, and analyze the acquired data to determine the mean scores for each aspect tested.

Table 1 : Gender of Respondent

		Frequency	Percent
Gender	Male	16	47.1
	Female	18	52.9
	Total	34	100.0

Table 2: Programme of Respondent

		Frequency	Percent
Programme	Diploma	10	29.4
	Degree	24	70.6
	Total	34	100.0

This research questionnaire was adapted from the "The impact of online learning during COVID-19: students' and teachers' perspective" conducted by (Nambiar, 2020). The instrument of this study has also been modified in terms of sentence structure so that it is appropriate to the situation in this study. The Likert scale method was used as the answer choice from the study respondents to identify their perceptions of online learning implementation. This Likert scale is also used to facilitate the researcher to identify the respondents' views and evaluations on the

items deemed appropriate. The following Table 3 shows the Likert scale evaluation scores used for this section.

Table 3: Likert Scale Scores

Statement	Score
Strongly Disagree	1
Disagree	2
Neutral	3
Agree	4
Strongly Agree	5

Result and Findings

A survey was conducted to understand students' perceptions of the online Mathematics learning methods introduced when the COVID-19 pandemic struck. The survey results were divided into two parts: availability of digital devices and reliable internet and 16 questions of students' perception of online Mathematics learning.

Referring to Table 4, all students have digital devices such as laptops, tablets, and smartphones. Higher learning institutions need to have at least one digital device to facilitate learning, especially students of Information Technology programs. In addition to having digital devices, online learning requires reliable internet access for online education to run smoothly. Unfortunately, 44.1% of the 34 students did not have and were likely to have reliable internet access. It allows online learning not to be delivered well and can affect student performance.

Table 4: Availability of Digital Devices and Reliable Internet

		Frequency	Percent
Do you own a digital device such as Laptop/ Tablet/ Smartphone?	Yes	34	100
	No	0	0
	Maybe	0	0
Do you have reliable access to the internet?	Yes	19	55.9
	No	3	8.8
	Maybe	12	35.3

The survey on students' perceptions of online Mathematics learning is divided into two parts: 1) the comparison between online Mathematics and Mathematics classroom modes and 2) personal factors in online Mathematics Class

Referring to Table 5, when the online Mathematics class was conducted, the students considered this online learning to be less viable than the in-class learning with a mean score of 2.9412. It is because students feel more adaptable with the classroom method than online classes (2.7059). Nevertheless, students acknowledged that this online learning was time-saving (4.1471) and more structured than classroom learning (2.7059). Moreover, they disagree that the quality of discussions between students and lecturers is poor (2.9118). In addition, students were neutral towards a shortage of interaction during online mathematics learning (3.0000), more learning and information exchange happens, disturbing technical problems (3.8824), and difficulty clearing doubts (3.5000) in online Mathematics classes compared to classrooms.

Table 5: Comparison between online Mathematics class and Mathematics classroom mode

	Mean	Std. Deviation
Online mathematics classes are more viable than classroom mode	2.9412	1.07142
There is a shortage of interaction during online mathematics classes	3.0000	1.23091
Online mathematics classes are more adaptable than the classroom method	2.7059	1.11544
The discussion's quality is poor in online mathematics classes	2.9118	1.33411
Learning and information exchange happens more in online mathematics classes	3.2059	1.00843
Online mathematics classes are less structured than classroom mode	2.7059	1.08793
Online mathematics classes save time	4.1471	0.95766
Technical concerns slow down online mathematics classes	3.8824	1.06642
There are more doubts in online mathematics classes than in classroom mood.	3.5000	1.16124

Table 6 shows an overview of personal factors in online Mathematics classes. Students disagreed with feeling unmotivated in the online Mathematics class with a mean score of 2.1176. In addition, students also disagreed with feeling lazy and disinterested when undergoing online Mathematics class learning (2.4118). Moreover, they also disagreed with feeling challenging to understand and follow online Mathematics classes (2.8235). Students think that the online Mathematics class is one of the appropriate methods to replace the face-to-face Mathematics

class in the era of COVID-19 with a mean score of 4.1471. In addition, students found that they felt neutral on more comfortable participating in online Mathematics classes than face-to-face classes (3.0294), felt less anxious (3.2941) and felt easily distracted, and had difficulty concentrating during online Mathematics classes (3.1471).

Table 6: Personal Factors in Online Mathematics Class

	Mean	Std. Deviation
I feel easier to participate in online mathematics classes discussion compared to classroom	3.0294	1.02942
I find it tough to grasp and follow online mathematics classes	2.8235	1.35893
I feel less nervous in online mathematics classes	3.2941	1.14228
I feel easily disturbed and find it difficult to concentrate during online mathematics classes	3.1471	1.37361
I feel lethargic and uninterested during online mathematics classes	2.4118	1.18367
I am not inspired to participate in online mathematics class discussions	2.1176	1.00799
I think online mathematics classes are one of the most appropriate methods during COVID-19	4.1471	0.95766

Discussion

This study found that 100 percent of students have their own digital devices to face online learning, consisting of Information Technology students either Diploma or Bachelor's Degree. This finding aligns with Ishak and Mir Ahmad Taalat (2020), where 93.9 % of students have their own digital devices comprising 27.2 percent use mobile phones, 63.1 percent use laptops, 2.9 percent use desktop computers and 0.6 percent use tablets. The remaining 6.1 percent borrow from parents or friends or rent at a computer centre. However, this finding contradicts Azman (2020), where 36.9 percent of students do not have a digital device. Of the findings, only six percent of students have a personal computer, 5.67 percent have a tablet, 9 percent have a laptop, and 46 percent have a smartphone. Therefore, students who do not have digital devices will face a big problem undergoing online learning because digital devices are one of the essential components of the online learning process.

These findings also show that only 55.9 percent of students have reliable internet accessibility. This statement aligns with Husin (2021), where 66 percent of students strongly agree, and 34 percent agree to have internet line problems. This major factor invites negative aspects in online learning. Apart from that, Hasmuddin and Maat (2020), in their review, found that students face difficulties in accessing the internet. This problem happens because internet lines in Malaysia have unstable internet speeds, depending on the place. This problem occurs not only in rural areas but also in urban areas (Kamaruzuki, 2021).

The study's findings found that the comparison between the online Mathematics class and the Mathematics class mode was in the neutral or moderate level. From these findings, students disagreed that the online Mathematics class was more effective than the online Mathematics class mode with an average of 2.9414. However, this finding contradicts the findings from Hairia'an and Dzainudin (2020) found that online teaching is effective because it is easily accessible and can be used at any time. Furthermore, the majority of them agreed that these online classes could improve their skills in using information technology tools. According to Ishak et al (2020), students can still not adapt overall to online learning because reliance on face-to-face learning is still needed. Nevertheless, findings from Nurul Shida show that e-learning (online learning) has a positive impact. She stated that lecturers need to be more creative and innovative to make online learning more exciting and appropriate to students' cognitive development so that the input obtained by students is easy to understand.

In addition, the findings also show that the mean student disagrees that online math classes are convenient. These findings are in line with the findings obtained by Husin (2021), Hashim et al (2020) and Hasmuddin and Maat (2020). In Husin (2021) findings, as many as 60 per cent comprising 42 per cent strongly agreed, and 28 per cent agreed, stating that online learning is not convenient due to the uncondusive home environment factor. This factor causes students' emotions to be easily disturbed and affected, which can invite to depression. In the discussion, Hashim et al (2020) stated that the both students and the lecturers felt uncomfortable teaching that focused on the online class without involving verbal communication with the students. In addition, Hasmuddin and Maat (2020) findings show that students quickly lose focus because the learning video during online learning is too long. Compared to Ishak and Mir Ahmad Taalat (2020), the findings showed that students were less comfortable with online learning platforms was moderate with a mean of 2.56. Therefore, this online learning becomes less comfortable to students due to uncondusive environmental factors and learning for too long disrupts students' emotions. However, students must accept the new norm life situation for this online learning to run smoothly.

Most of the students agreed that an online Mathematics class could save time with a mean score of 4.1471. Most of the findings of previous studies found that online learning can be more time-saving. In the Nambiar (2020) study, 49.7 percent agreed online classes can save time compared to 29.8 percent disagreed because students are more comfortable at home, which saves time without having to walk, travel and rushing to the place of study. From Hasmuddin and Maat (2020) review, the application used in e-learning can save time and even save energy. In addition,

Husin (2021) findings show that online learning saves time and saves implementation costs, hostel accommodation, and self-sufficiency. This time saving allows students to spend more time with their families.. Conduct online learning for a long time can cause students to lose focus and discomfort.

The quality of the discussion was low in the online mathematics class, and the students disagreed with the less structured online mathematics class with a score mean of 2.9118 and 2.7059, respectively. This finding is not in line with the findings from Nambiar (2020), who stated that students agreed that the quality of discussion in online classes was low and online classes were less structured with 79 percent and 70.6 percent, respectively. The quality of more structured discussions and teaching in online mathematics classes can be improved if the teaching and learning process uses the technology of interest if the presentation materials used are interactive, realistic, innovative and exploratory and easily accessible anywhere.

From the findings of personal factors, the average student showed a positive attitude in online mathematics classes. Students disagree that online math learning is challenging to understand and follow. According to (Hasmuddin & Maat, 2020), learning Mathematics online is easy to understand due to the use of attractive graphics. Nevertheless, (Nambiar, 2020) findings show the opposite when students agree that online classes are challenging to understand and are followed by 68.4 percent. In addition, the findings of Ishak and Mir Ahmad Taalat (2020) showed that lecturers diversified presentation techniques to strengthen understanding was at a moderate level with a mean score of 3.46. Therefore, although various presentation techniques are used, lecturers need to be more creative and innovative with graphics to attract the attention and focus of students in learning.

Moreover, students also disagreed that they felt lazy and disinterested during the online Mathematics class with a mean score of 2.4118. This feeling of laziness is related to student motivation. Then also, students disagree with not being motivated to participate in this online mathematics class with a mean score of 2.1176. The review of Hasmuddin and Maat (2020) study shows that students are more motivated to prove and demonstrate the strategies used during e-learning. The findings from Mailis et al (2020), motivational strategies used by lecturers in implementing online learning is at a moderate level with a mean score of 3.36. Similarly, Ishak and Mir Ahmad Taalat (2020) findings stated that the level of student motivation was intermediate, with an overall mean value of 2.91. The results also found a significant positive relationship between student motivation variables and online learning variables. However, the findings from Nambiar (2020) were the opposite when students agreed to feel lazy and disinterested during online classes with 59.3 per cent and felt unmotivated to join online classes with 59.5 per cent. Therefore, diversifying online presentation and learning techniques can attract the interest and motivation of students.

Although online Mathematics learning had positive and negative perceptions from students, most students acknowledged that online Mathematics class was the most appropriate method when facing a COVID-19 situation with a mean score of 4.1471. However, online classes require

good internet access. Husin (2021) suggested upgrading internet access throughout the country, especially in rural areas, so that students can equally attend the online teaching and learning process wherever they are. Students recommend this proposal 100 percent. According to Hairia'an and Dzainudin (2020), the use of technology in education facilitates effective learning despite some constraints. In addition, Mailis et al. stated that higher and effective improvement efforts need to be stepped up from time to time to ensure that online learning can be carried out better in the future. In addition, according to Ishak and Mir Ahmad Taalat (2020), learning facilities and infrastructure should also be seen and considered so that there is no disruption in teaching and learning. Therefore, to breathe learning with a new norm life, online learning is the most suitable method. However, several aspects need to be seen, such as internet access, the use of technology, and the improvement of online learning infrastructure need to be improved to facilitate students to face the learning process.

Conclusion

To ensure that students do not miss out on face-to-face learning, online learning is fully implemented. Several facilities are required to conduct online classes smoothly, such as digital devices and internet facilities. This facility is necessary to run online learning either synchronously or asynchronously.

Findings show all Information Technology students at UniSHAMS have digital devices to undergo online Mathematics learning. Nevertheless, only 55.9% of respondents have reliable internet. This lack can cause learning Mathematics online to be less effective and make students uncomfortable learning mathematics online. However, despite the shortcomings, there is an advantage that learning Mathematics online can save time, and the class becomes more organized compared to face-to-face learning.

In addition, the findings show that students think that learning Mathematics online is the single most appropriate method when curbing this COVID-19 epidemic. Furthermore, students feel motivated, easy to understand, easy to follow, do not feel lazy, and feel interested in learning Mathematics online.

In conclusion, learning Mathematics online has many advantages compared to disadvantages, although students feel more comfortable learning face-to-face than online. Nevertheless, online learning is the most appropriate method to ensure that students do not miss out on learning no matter where they are. However, suppose the government, institutions of higher learning, academicians, and students take responsibility for improving the existing weaknesses. In that case, this online learning will attract students to learn in online mode, especially Mathematics.

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