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Readiness, Knowledge, and Attitude towards Online Mathematics Learning among Technical Institute Students

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Abstract

The use of online learning methods provides new learning to teachers and students especially in mathematics education. The face-to-face learning method change to this method was first introduced when the country was hit by the COVID-19 pandemic. This led to the changes of students' knowledge, attitude, and readiness towards online mathematics learning. In relation to that, the level of students' knowledge, attitude, and readiness to use online platform methods will be identified in this study. The random selection of 69 students at one of the technical based institutes in the Kuching districts who are involved in this quantitative study in the form of a survey, were randomly selected. The instrument was prepared in Google Form and distributed to students through the WhatsApp application. The questions developed are in the form of a 5-point Likert scale with a choice of scales that have interpretation levels. This data was analysed using descriptive statistics, and it was found that students have a high level of students' readiness to use the online method in mathematics. The finding revealed that the students have a high level of knowledge on this online mathematics learning method. Findings also found that students showed a positive attitude to use online for mathematics learning. The use of online learning has many positive impacts, where students can have mathematics learning sessions wherever they are. The proposed further study is to identify the challenges and effectiveness of using online learning methods for teaching and learning among students.

Keywords: Online Learning, Knowledge, Attitude, Student, Readiness, Mathematics

Introduction

The definition of technology not only involves the application of modern and up-to-date software and hardware but also closely relates to the methods, techniques, or processes that have an impact when used. Pertiwi and Sutama (2020) defined online classes as a learning technology integrated with application facilities based on a Learning Management System (LMS) and video conferencing in their study. Meanwhile, Dea and Firdausi (2019) stated that online classes are classes in which the internet, multimedia, and technology are used as mediums for learning activities during online teaching. Online classes were defined as a

concept of digital learning, where the user, namely the learner, is connected to the server through the internet network.

Along with technological advancements, the definition of electronic learning or e-learning often changes. In its promotion, it is often misinterpreted. Generally, e-learning refers to any teaching and learning process that utilizes electronic networks to interact or facilitate the delivery of learning content. The concept of e-learning or online learning represents a shift in education from face-to-face learning methods to a digital form that encompasses learning systems and their content (Cronje, 2020). From these studies, it can be concluded that the use of online class methods or, more simply, online learning methods, requires an internet network for its implementation.

Since the announcement of the Malaysia Movement Control Order (MCO) on March 18, 2020, online teaching and learning processes have been used to replace conventional learning. Although online learning has been introduced for a long time, its widespread use only became prominent after the MCO announcement. Superficially, the use of e-learning or online learning approaches in teaching and learning differs from conventional learning approaches. In conventional learning, the teacher is the main source responsible for delivering instruction or knowledge to students (Versteijlen & Wals, 2023). At present, online learning has become a common phenomenon. In fact, online learning is categorized as the use of information technology to enhance the quality of education (Almanthari et al., 2020).

Platforms serve as strategies for implementing online teaching and learning methods. Various platforms have been introduced for this purpose, including the use of applications such as Microsoft Teams, Google Classroom, Telegram, WhatsApp, and YouTube. Microsoft Teams is a platform or application introduced by Microsoft. Microsoft integrates the Microsoft Teams application with Microsoft Office 365. Microsoft Teams offers various attractive and conducive functions. When an individual or institution subscribes to this application, they can establish collaborative relationships and engage in various activities easily and quickly. The community within this application can not only collaborate and share files from the same location but also virtually meet as if they were in the same place. Microsoft Teams is used as the primary platform for conducting online teaching and learning sessions in the location of the study. The use of the Microsoft Teams application as the main platform for online teaching and learning during Covid-19 has proven to be highly effective (Ismail et al., 2020). To what extent students are willing to accept online teaching and learning as their learning method will be identified in this study. Hence, the researcher found the need to conduct this study particularly in determining the level of students' readiness, knowledge, and attitude towards online mathematics learning.

Students should be familiar with online learning platforms specifically on how to access lessons, participate in virtual discussions and submit assignments. Online mathematics learning requires students to keep track of deadlines and should be able to be disciplined in classroom engagement (Deschaine & Whale, 2017). They should have profound knowledge in technology especially in using computers, finding internet resources and troubleshooting. Good knowledge in online learning leads to effective communication which enhances the students' skills in articulating questions and ideas whether in written form or virtual form. Having said that, students should possess a positive attitude towards online learning due to difficulty that they faced in mathematics. The willingness to explore new ways of learning mathematics will enhance the students' understanding (Lo & Hew, 2020). Viewing mistakes

during online mathematics learning will improve students' progress and foster a positive mindset. Being proactive in online mathematics learning will cultivate curiosity in exploring mathematical concepts in online mathematics learning. Students' engagement will get better, which indirectly promotes a deeper grasp of mathematics. However, there are some challenges such as getting immediate feedback from the instructors. Hence students should have a resilient attitude and have perseverance in maintaining the determination of their learning goals.

The level of technological readiness is a benchmark used to assess the feasibility of introducing a particular technology. Unsatisfactory internet accessibility, expensive data purchases, a less conducive learning environment, and ineffective virtual learning are among the obstacles faced by students in Public Higher Education Institutions (Yahaya et al., 2021). Internet access problems, whether in terms of connectivity or data quotas for accessing online learning, are common challenges during the remote learning process. The lack of Information and Communication Technology (ICT) infrastructure, including inadequate internet facilities and computer labs in Vocational Colleges (KV), hinders the integration of ICT (Al-Ghurbani et al., 2022). The framework of this study is built upon the Technology Acceptance Model (TAM) (Silva, 2015). This framework is based on the Connectionism Learning Theory (Kop & Hill, 2008) and Connectivism Learning Theory (Goldie, 2016). The changes and effects in learning brought about using new technology through networks are evident in both theories. Learning that emphasizes the dissemination and distribution of knowledge in a structured manner refers to the Connectionism Learning Theory (Downes, 2006). Emphasis is given to learning that focuses on the relationships and interactions among users in a social network using Web 2.0 tools such as wikis and blogs, based on the Chaos Theory and network theory, which refers to the Connectivism Theory. Both theories can be applied in online learning of mathematics. This is because online learning utilizes networks as a connector between students and teachers through platforms such as Google Classroom, Zoom, and Microsoft Teams. Through these platforms, teaching and learning of mathematics can be delivered in a more interactive form to engage their interest in their learning.

It is revealed that most the respondents were ready to participate in online mathematics learning. Students were observed to have a positive perception of the use of interactive multimedia during their learning process use of MOOCs (Massive Open Online Courses) was also seen to attract students' interest. Students' readiness can be a barrier to online learning. Therefore, the level of students' readiness needs to be measured to determine whether they are prepared to accept changes in their learning system or not. Monitoring and understanding students' engagement with a particular subject are crucial to ensure the successful implementation of this learning method. Hence, there is a need to identify students' readiness for the use of this learning approach.

Methodology

The selection of 69 students from one of the instutute in the Kuching district, who participated in this quantitative survey study, was done randomly. The instrument was developed based on literature obtained from journals and theses related to online learning (Ridzuan et al., 2020). The instrument was prepared in Microsoft Form and distributed to students through the WhatsApp application. The developed questions were in the form of a 5-point Likert scale with interpreted scale levels.

The instrument consisted of four sections. Section A (respondents' profile), Section B (students' knowledge level), Section C (students' attitude), and Section D (students' readiness level). The quantitative data were analyzed using descriptive statistical methods in the Statistical Package for the Social Sciences (SPSS) software version 26.0. The levels of knowledge, attitude, and readiness in online learning were examined using frequency, percentage, and minimum values. The mean level is categorized according to the respective interpretation as shown in Table 1.

Table 1
Interpretation of Mean Level

Mean value	Interpretation
1.00 – 1.80	Very low
1.81 – 2.60	Low
2.61 – 3.40	Moderate
3.41-4.20	High
4.21-5.00	Very High

Results

Respondent Profile

Descriptive statistics was used for reporting data of the demographic of the respondents. The demographic information of the respondents included gender, semester of study, computer ownership, Information and Communication Technology (ICT) skills level, internet accessibility, and data purchasing method. Through the analysis of the study, it was found that the study had a total of 69 respondents. The number of male respondents was 56 (81%), while the number of female respondents was only 13 (19%).

It is reported that there were 31 students (45%) from semester 1 involved in this study, while semester 2 students accounted for 38 individuals (55%). As for the computer ownership on average, respondents owned their own computers, totalling 45 individuals (65%). However, there were still 24 individuals (35%) who did not have their own computers.

In addition, it was found that students possessed computer handling skills. There were 3 students (4%) who were highly skilled in computer handling, followed by 11 individuals (16%) who were skilled. On average, the students involved in this study had a moderate level of computer handling skills, with a total of 44 individuals (64%). Only 10 students (15%) had a less skilled level of computer handling, and 1 individual (1%) was not skilled in computer handling.

As for the internet accessibility was to be at a moderate level. This can be observed from the analysis of the study, where 33 respondents (48%) stated that their internet accessibility was at a moderate level. A total of 22 individuals (32%) reported that their internet accessibility was good, while 9 individuals (13%) indicated it was very good. 3 respondents (4%) had poor internet accessibility, and 2 individuals (3%) had very poor internet accessibility.

While for the internet data purchases, many students preferred to use prepaid (unlimited monthly) for data purchases, with a total of 45 individuals (65%). This was followed by purchasing data through postpaid (unlimited) by 10 individuals (14%). 5 individuals (7%) chose to purchase prepaid data on a weekly unlimited basis, while another 9 individuals (13%) opted for prepaid weekly internet purchases.

Descriptive analysis method was used to obtain the minimum score and standard deviation for the aspects of knowledge, attitude, and readiness of students in using online learning for Mathematics. Table 2 shows the level of students' knowledge regarding the use of Microsoft Teams as a platform for online learning. Based on the table, the students' knowledge level indicates a high overall minimum interpretation (M = 3.61, SD = 0.75). The analysis results show that item B5 recorded the highest percentage of agreement, with 46 individuals (66.6%) agreeing. Respondents agreed and strongly agreed, with 45 individuals (65.2%), that they are proficient in signing in or signing out when using Microsoft Teams. A total of 43 individuals (62.3%) strongly agreed and agreed with items B1, B3, B4, and B6. This clearly indicates that respondents strongly agree and agree with statements that they know how to access Microsoft Teams and use it to submit assignments. They also believe that Microsoft Teams is suitable for implementing Mathematics learning and that its use can improve their computer skills.

Only 56.5% (39 individuals) strongly agreed and agreed to state that they are proficient in downloading images and videos within Microsoft Teams. This finding clearly demonstrates that only a portion of the students can use the applications available in Microsoft Teams. Item B9 had the lowest percentage of agreement, with only 28 individuals (40.6%) agreeing with this item. This provides an explanation that many students are still not proficient in using the whiteboard, an application available in Microsoft Teams. Overall, the findings from this analysis indicate that students have a high level of knowledge in using platforms like Microsoft Teams as their teaching and learning medium.

Table 2
Level of students' knowledge in using online learning for mathematics.

No	Item	Strongly Disagree n(%)	Disagree n(%)	Less Agree n(%)	Agree n(%)	Strongly Agree n(%)
B1	I know how to access Microsoft Teams.	2 (2.9%)	2 (2.9%)	22 (31.9%)	34 (49.3%)	9 (13.0%)
B2	Learning using the Microsoft Teams environment improves my Mathematics proficiency.	2 (2.9%)	5 (7.2%)	25 (36.2%)	29 (42.0%)	8 (11.6%)
B3	Microsoft Teams is suitable to be applied in learning Mathematics.	2 (2.9%)	3 (4.3%)	21 (30.4%)	36 (52.2%)	7 (10.1%)
B4	The use of Microsoft Teams can improve my computer skills.	4 (5.8%)	2 (2.9%)	20 (29.0%)	33 (47.8%)	10 (14.5%)
B5	The use of Microsoft Teams can improve my skills in using the internet.	5 (7.2%)	0 (0.0%)	18 (36.1%)	35 (50.7%)	11 (15.9%)
B6	I know how to send assignments using Microsoft Teams.	2 (2.9%)	0 (0.0%)	24 (34.8%)	32 (46.4%)	11 (15.9%)
B7	I am good at sign in and sign out Microsoft Teams.	3 (4.3%)	1 (1.4%)	20 (29.0%)	35 (50.7%)	10 (14.5%)
B8	I'm good at downloading pictures and videos in Microsoft Teams.	2 (2.9%)	2 (2.9%)	26 (37.7%)	29 (42.0%)	10 (14.5%)
B9	I know how to use "whiteboard" in Microsoft Teams.	2 (2.9%)	7 (10.1%)	32 (46.4%)	22 (31.9%)	6 (8.7%)
	Overall	**M=3.61, SP =**		**0.75**		

Students' Attitude Level in Online Learning

Table 3 shows the level of students' attitude towards the use of Microsoft Teams as a platform for online learning. Based on the table, the students' attitude level indicates a high overall minimum interpretation (M = 3.69, SD = 0.74). The analysis results show that item C8 recorded the highest percentage of agreement, with 52 individuals (75.3%) agreeing. Respondents also agreed and strongly agreed, with 51 individuals (73.9%), that they enjoy using Microsoft Teams because it is easily accessible anywhere. A total of 49 individuals (71.0%) strongly agreed and agreed with item C5. This is followed by item C7, with 46 individuals agreeing that they like the display of Microsoft Teams because it is attractive. For item C2, 45 individuals (65.2%) of the students agreed and strongly agreed that they feel excited when accessing the Microsoft Teams learning environment.

Only 63.8% (44 individuals) strongly agreed and agreed to state that they like communicating using chat in Microsoft Teams. Item C1 had the lowest percentage of agreement, with only 43 individuals (40.6%) agreeing with this item. Overall, the findings from this analysis indicate that students have a high level of knowledge in using platforms like Microsoft Teams as their teaching and learning medium.

Table 3
Level of students' attitude in using online learning for mathematics.

No	Item	Strongly Disagree n(%)	Disagree n(%)	Less Agree n(%)	Agree n(%)	Strongly Agree n(%)
C1	I like learning using the Microsoft Teams learning environment.	2 (2.9%)	5 (7.2%)	19 (27.5%)	36 (52.2%)	7 (10.1%)
C2	I enjoy accessing the Microsoft Teams learning environment.	2 (2.9%)	2 (2.9%)	20 (29.0%)	39 (56.5%)	6 (8.7%)
C3	It's easy for me to learn Math using Microsoft Teams.	3 (4.3%)	3 (4.3%)	23 (33.3%)	32 (46.4%)	8 (11.6%)
C4	I enjoy using Microsoft Teams because it is easily accessible on anywhere.	2 (2.9%)	1 (1.4%)	15 (21.7%)	43 (62.3%)	8 (11.6%)
C5	I like using the Microsoft Teams learning environment to find learning materials.	2 (2.9%)	1 (1.4%)	17 (24.6%)	40 (58.0%)	9 (13.0%)
C6	I am responsible in handling Microsoft Teams.	3 (4.3%)	4 (5.8%)	20 (29.0%)	34 (49.3%)	8 (11.6%)
C7	I like the attractive look of Microsoft Teams.	2 (2.9%)	2 (2.9%)	19 (27.5%)	36 (52.2%)	10 (14.5%)
C8	I like using Microsoft Teams with friends	2 (2.9%)	1 (1.4%)	14 (20.3%)	37 (53.6%)	15 (21.7%)
C9	I like to communicate using chat in Microsoft Teams.	4 (5.8%)	1 (1.4%)	20 (29.0%)	34 (49.3%)	10 (14.5%)
	Overall	**M=3.69 , SP =**		**0.74**		

Students' Readiness in Online Mathematics Learning

Table 4 shows the level of students' readiness towards the use of Microsoft Teams as a platform for online mathematics learning. Based on the table, the students' attitude level indicates a high overall minimum interpretation (M = 3.74, SD = 0.74). The analysis results show that items D3, D5 and D9 recorded highest percentage of agreeing with 50 individuals. However, most respondents were found to have basic knowledge about online learning with n=54. Most likely the respondents have the internet, use Microsoft Teams outside of learning hours and they can improve their knowledge on online learning.

Table 4
Level of students' readiness in using online learning for mathematics.

No	Item	Strongly Disagree n(%)	Disagree n(%)	Less Agree n(%)	Agree n(%)	Strongly Agree n(%)
D1	I have basic knowledge about online learning.	2 (2.9%)	2 (2.9%)	11 (15.9%)	42 (60.9%)	12 (17.4%)
D2	I am ready to use Microsoft Teams in learning Mathematics	4 (5.8%)	3 (4.3%)	19 (27.5%)	33 (47.8%)	10 (14.5%)
D3	I have access to the internet	3 (4.3%)	2 (2.9%)	14 (20.3%)	37 (53.6%)	13 (18.8%)
D4	Microsoft Teams makes it easy for me to interact with my friends about learning Mathematics	2 (2.9%)	2 (2.9%)	21 (30.4%)	35 (50.7%)	9 (13.0%)
D5	I can learn to use Microsoft Teams outside of learning hours.	2 (2.9%)	2 (2.9%)	15 (21.7%)	39 (56.5%)	11 (15.9%)
D6	I use Microsoft Teams at the institution during Mathematics learning.	3 (4.3%)	1 (1.4%)	18 (26.1%)	35 (50.7%)	12 (17.4%)
D7	I can access Microsoft Teams easily because I have computer facilities at home.	4 (5.8%)	2 (2.9%)	20 (29.0%)	30 (43.5%)	13 (18.8%)
D8	I can access Microsoft Teams easily because I have computer facilities at the institution.	4 (5.8%)	2 (2.9%)	16 (23.2%)	37 (53.6%)	10 (14.5%)
D9	I always improve my knowledge about online learning.	2 (2.9%)	1 (1.4%)	16 (23.2%)	38 (55.1%)	12 (17.4%)
	Overall	**M=3.74 , SP =**		**0.74**		

Discussion

There is a significant difference in the number of male and female respondents in this study because the selected respondents consist of students from a particular Skills Institute. The enrolment of female students in this institution is limited to certain study programs only. This study also only involves students from the first and second semesters. This is because the subject of mathematics is only offered in the first and second semesters. However, this study did not examine the gender or semester differences for the three discussed factors.

Based on the analysis, most respondents have their own computers. However, there are still some among them who do not have their own computers. From the respondents' perspective, the skill level in handling computers is at an intermediate level. The accessibility level of the respondents' internet is also at an intermediate level. Respondents prefer to make unlimited monthly internet purchases. This method may be more cost-effective compared to other methods. The analysis results also indicate that respondents do not have any issues with purchasing internet data for use during online learning.

The students' perception of learning mathematics using Microsoft Teams as a learning medium is at a high level for all the factors studied, namely knowledge, attitude, and readiness. The minimum interpretation for the knowledge level is also high. These findings are consistent with the findings in a study by Bakar et al. (2022), where the knowledge factor showed a high level of acceptance, with respondents expressing that they would be left

behind if they did not use online learning methods such as Google Classroom as their learning medium.

The students are very positive in accepting Microsoft Teams as their online learning medium, as assessed from the findings of this study. The minimum score for the students' attitude level towards this new learning method is also high. For example, the use of VLE Frog was positively accepted among students because it enhanced their internet skills (Raman & Rathakrishnan, 2018). Siti Fatimah and Siti Hasmiza (2018) also agreed, stating that Massive Open Online Courses (MOOCs) were viewed positively by respondents as a learning medium. The study by Amani and Hamidaton (2020) also found that students had a positive attitude towards the use of Microsoft Teams.

Online learning using Microsoft Teams as a learning medium can help in mathematics because classes can still be conducted like face-to-face classes. Moreover, this type of learning is more flexible as it can be recorded and accessed by any student who is unable to attend class. This can be seen from the analysis findings of this study, where the percentage of strong agreement and agreement for the statement that they can download images and videos in Microsoft Teams is high. This is in line with the findings from a study by Nambiar (2020), where students who are unable to attend class or those who do not understand the learning session at that time can review the recordings repeatedly as this learning method is flexible.

The readiness of students to use Microsoft Teams as an online learning medium is seen to help teachers in implementing their teaching. To realize this learning method, students must be prepared to discipline themselves so that they can attend online learning sessions. Not only that, but students must also be prepared to self-study by downloading all the learning materials provided by the teacher. These findings indicate that respondents are prepared to accept Microsoft Teams as their new learning medium, with the minimum score for the readiness level being very high. This study's findings are supported by a study conducted by Amani and Hamidaton (2020), where students have provided feedback and are ready to use Microsoft Teams as their online learning medium in the future. The study by Sofie et al (2019) also stated that student motivation is significantly increased.

Conclusion

The attitude of students is the main factor in measuring the effectiveness of online learning methods. Online learning has been found to have various positive impacts on the implementation of teaching and learning during the COVID-19 pandemic emergency. Through online learning, any situation that students may face can prevent them from missing out on their education. This is due to the rapid advancement of technology and the use of platforms such as Microsoft Teams, as well as applications like WhatsApp and Telegram, which have opened opportunities for students and teachers to interact with each other to conduct their learning sessions. However, there are various constraints faced by students and teachers in implementing this learning method. Limitations in terms of costs, student capabilities, and the readiness of technology in Malaysia itself can hinder the implementation of this learning method, not only at present but also in the future. Therefore, a proposed further study is to identify the challenges of teaching and learning Mathematics using online learning and to what extent the effectiveness of using online learning methods for teaching Mathematics should be measured so that this learning method can remain relevant for future use.

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