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Experiences and Challenges in Learning of Civil Engineering Materials (CEM) Course during the COVID-19 Pandemic among Civil Engineering Society (CES) Students

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Abstract

The COVID-19 disease has created the largest disruption in human history, affecting all sectors especially educational systems. Closure of schools, universities, and other educational premises due to pandemic has forced higher education and researchers to create a new alternative way on how to alleviate this problem. E-learning and online instructions is one of the most notable methods that is highly recommended during this pandemic. Thus, this paper aims to investigate the experiences and challenges in learning Civil Engineering Materials (CEM) during COVID-19 pandemic among Civil Engineering Studies (CES). This quantitative study data was conducted to 159 students who enrolled in the CEM course. The student's experiences and challenges while undergoing online learning sessions and how the students can adapt to the CEM course with the new learning environment is the main concern of this study. The result showed that most of the students had a variety of problems such as internet access, discomfort, and inappropriate places to complete the required assessment. Whilst facing the risk of loss of enthusiasm in learning, lack of focus and lack of communication skills between the teaching staff and friends.

Keywords: E-Learning Challenges, Self-Learning, Face-To-Face Learning, Civil Engineering Studies

Introduction

The current crisis of the pandemic COVID-19 forced the whole world to rely on e-learning education, which was very underused in the past, especially in developing countries. Since the novel coronavirus COVID-19 which was reported as a pandemic in March 2020 by World Health Organization (WHO) has no boundaries, the effect is large and fast, creating tremendous educational disruptions and radically changing the educational environment (WHO, 2020). The pandemic has also forced all educational institutions in Malaysia to be

temporarily closed resulting in the termination of the face-to-face educational method by the Ministry of Health Malaysia (MOH). Thus, this crucial scenario gives a big blow to educational activities, as social distance and information technology literacy are important at this point. The crisis has made all Malaysians embrace new technologies in all sectors although most sectors are less focused on the use of information technology in facilitating operations. This is a difficult challenge for the education sector to deal with in the current situation, especially professional education, especially education at the level of Institutions of Higher Learning (Kaur et.al., 2020).

An e-learning education has grown into the foremost and essential solution for the whole world since the global outbreak of the pandemic has spread worldwide, affecting almost all countries and territories. It is the alternative way to mitigate this difficult situation in a short amount of time (Dhawan, 2020). This closure stimulates the growth of online educational activities so that educational activities continue to run and are uninterrupted at various levels. All educational institutions have been directly involved and are moving quickly to find ways of teaching and learning methods by sharing course materials online that correspond to current constraints. Student assessment methods are also influenced by the evolution of online education (Mukhtar et. al., 2020).

E-learning is a learning experience using a variety of electronic devices (e.g., computers, laptops, smartphones, etc.) with the availability of the internet in a synchronous or asynchronous environment. Digital learning has provided us with an opportunity to pave the way (Dhawan, 2020) and become a platform that makes the educational process more student-centered, creative, and flexible (Colace, et. al., 2006). Online course delivery is cost-effective and easily accessible, especially when delivering the curriculum to students in rural and remote areas (Dhawan, 2020). e-learning is seen by the United Nations (UN) and WHO as a helpful tool to meet educational needs, especially in developing countries (Colace et. al., 2006). Civil Engineering Studies (CES), College of Engineering has implemented various creative strategies to combat the crisis, using various software/apps such as Google Classroom, Zoom, and Microsoft Team to take online courses. It is also a tool to stay in touch with students virtually to inspire and motivate students in the learning world of this new millennium. It is to increase certainty and give confidence to engineering students that they can study and compete in the employment sector when there is a fight in the future even though the pandemic is not yet over (Kaur et.al., 2020).

Pedagogy in continuing education online during the pandemic in compliance with social distancing measures due to the pandemic resulted in the closure of all educational institutions such as schools, training institutes, and higher education institutions in most countries (Pokhrel & Chhetri, 2021). There is a drastic paradigm shift in the way educators deliver education without neglecting the quality and spirit of education through various online platforms (Subedi et. al., 2020). It is expected that with the implementation of e-learning, the role of lecturers will change from a teacher-centered model to a student-centered model in line with the current new curriculum applied in our engineering colleges. Therefore, this study aimed to estimate students ’perceptions by evaluating their experiences and identifying their barriers and challenges to e-learning during the pandemic. In addition, this study will investigate the factors influencing the acceptance of e-learning as a tool for teaching in higher education that can help universities to identify whether implementing e-learning is appropriate or otherwise, for engineering students, this is because it involves skills, psychomotor students, if it is absorbed in the lifelong learning method of teaching.

Moreover, educational institutions have been directly involved and moving fast to find the best method to teach and learn through online course materials that fit the current constraints. This closure stimulates the growth of online educational activities so that educational activities continue to run and are uninterrupted at various levels. However, enhancing the quality of teaching and learning during the crisis is a tough challenge that must be faced by the education sector, especially education at the level of Institutions of Higher Learning (Kaur et.al., 2020). The realities of teaching and learning in the online environment are varies as per the convenience, expertise among the educators and compatibility of the students. The accessibility, availability and use of the technology are considered low and poor which can hinder a smooth study environment throughout online classes. It is well-known that most of the students come from poor economic backgrounds. The students have their limitations to afford the best online learning devices and a good network with stable online tools. The data package (internet) that must be used during online classes is comparatively high against the average income earned and the need to continuously maintain network access during online classes is a costly business.

Son et. al (2020) stated that 71% showed increased stress, anxiety, annoyance, and depression among students due to the pandemic. Other difficulties that must be faced by the education sectors are how to deliver the best learning experience, how to maintain class enthusiasm and learning attention, and organizing two-way communication feedback and discussion that is beneficial for the students after they are graduating. This difficulty is one of the major issues that must be faced by the university. According to Sintema (2020), the level of academic performance of the students is likely to drop for the classes held for both year-end examination and internal examination due to reduced contact hours for students and lack of consultation with teachers when facing difficulties in learning and understanding. Apart from this, some of the options are to conduct pre-recorded videos and engage in offline activities or self-exploratory learning (Totaro et. al., 2005).

However, this would restrict interactions and it is difficult to design a proper system to fit the learning needs and convenience of all students, but most instructors try to prepare the contents of instructions well (Chang & Fang, 2020). Thus, the Objective of this study is to estimate the perceptions of university students, i.e., to assess the experience and identify barriers and challenges of e-learning during the pandemic. Therefore, the aim of this study is to identify and evaluate the impact of the pandemic on the teaching and learning process through the perceptions of university students, i.e., assess the experience and identify barriers and challenges of e-learning that arise in summarized and way forward suggested.

Methodology

After the university determined that online learning was used during the pandemic, CES College of Engineering applied the ruling for engineering courses either for theory or involving laboratories courses and all the assessments in fact the final evaluation was conducted fully via online learning. The CEM course offers two credit hours with lecture mode, the breakdown of scores for the final assessment is 50%, while the scores for the ongoing test consist of a 20%, a 10% for individual assignments and a 20% for the group project.

Research Methods and Study Participants

To obtain quantitative study data, the respondents to this study consisted of Diploma in Civil Engineering students who enrolled in the Civil Engineering Materials (CEM) course. The survey was conducted where evaluating the willingness of students to study online is essential for

measuring their learning outcomes. All 159 students who enrolled in the CEM course participated as respondents, they had to answer the set of questionnaires, i.e., after the 10th week of the online lecture session of the semester. This online questionnaire survey was conducted using a Google survey. The aim of this study is to identify students' experiences and challenges while undergoing online learning sessions at home. It is to identify how students adapt to the CEM course with the new learning environment which is significantly different from the previous one. Students need to adapt to different situations at home, learning methods, infrastructure, support, and responsibilities compared to face-to-face learning on campus.

Data Collection Procedures

The questionnaire was tested on six CEM lecturers before it was given to students. The necessary modifications, changes, and corrections have been made to ensure that students clearly understand the meaning of all questions. Then a total of 159 students from semester 4 answered the question. The electronic questionnaire was designed on a Google Form, and the invitation link for participation in the survey was shared by the lecturers via WhatsApp groups for their respective classes. Students were given some time to answer the questionnaire. Students are informed about the study's goals, emphasizing the importance of cooperation by the respondents.

The semi-tailored computerized questionnaire that was developed consists of five sections:
First section: questions about participants' socio-demographic information, including gender, the number of siblings they have, how many bedrooms they have, where they live, their parents' employment, and household income.
Second section: included inquiries about the student's residence's internet availability and gadget tools' usability.
Third section: involves gathering data on the number of student courses that have been registered.
Fourth section: component involves gathering information about the lecturers' presentation style, the course materials, and the lecturers' demeanour throughout the e-learning session.

Questions regarding the difficulties and experiences of online course students make up the fifth section. The pandemic's effects on the classroom environment, family support, student learning time, health level, and students' perceptions of teaching strategies are all included. A five-point Likert scale is used to evaluate questions. Students can express how much they agree or disagree with the requirements of the question by giving a score between 1 and 5, with 5 being the most agreeable.

Results

Respondents Profile

The total number of respondents was 159 students who registered in the Civil Engineering Material (CEM) course, Diploma in Civil Engineering participated in this study. There were more female students (90/159, 57%) than male students (69/159, 43%). During pandemic COVID-19, about 59 students were online in rural areas (59/159, 37%) and 100 students in urban (100/159, 63%) areas. Furthermore, most student residences have more than 3 bedrooms (137/159, 86%), and only 14% of student residences have less than 3 bedrooms (22/159, 14%). Among them, the majority of students have a number of siblings less than 5

people (115/159, 72%). In addition, the students come from a household income below RM 5000 (109/159, 69%) which is classified as B40 and the rest is M40 and T20 (50/159, 31%) (Table 1). It is noteworthy that B40, M40, and T20 refer to the household income classification in Malaysia. B40 represents the Bottom 40%, M40 represents the middle 40%, whereas T20 represents the top 20% of Malaysian household income (Department of Statistics Malaysia, 2019).

Table 1
The respondents' demographic profile

	Demographic Characteristic	Frequency (n=159)	Percent
Gender	Male	90	56.6
	Female	50	43.4
Location	Rural	59	37.1
	Urban	100	62.9
Number of Bedrooms in house	1	2	1.3
	2	20	12.6
	3	73	45.9
	4	40	25.2
	5	21	13.2
	6	1	0.6
	7	1	0.6
	9	1	0.6
Number of Siblings	0	3	1.9
	1	8	5.0
	2	26	16.4
	3	39	24.5
	4	39	24.5
	5	28	17.6
	6	9	5.7
	7	4	2.5
	8	2	1.3
	11	1	0.6
Household Income during MCO	Less than RM1000	29	18.2
	RM1001 - RM2000	27	17.0
	RM2001 - RM3000	14	8.8
	RM3001 - RM4000	20	12.6
	RM4001 - RM5000	19	11.9
	RM5001 - RM6000	10	6.3
	RM6001 - RM7000	10	6.3
	RM7001 - RM8000	8	5.0
	More than RM8001	22	13.8

Gadget and Internet Connection

Most of the respondents owned personal computers (145/159, 93%), and only 5% shared with siblings (8/159). For the type of internet service subscription, the students used prepaid (83/159, 52%) and post-paid (76/159, 48%). The results showed internet access was very satisfied (7/159, 4%), satisfied (40/159, 25%), moderate (80/159, 50%), while poor and very poor (32/159, 20%) during the pandemic. In addition, most students spend more than RM50 (81/159, 51%) and less than RM50 (78/159, 49%) for internet subscriptions cost (Table 2).

Table 2
The Gadget and Internet Connection Characteristics

	Gadget and Internet Description	Frequency (n=159)	Percent
Own Personal Computer	Yes	147	92.5
	No	4	2.5
	Shared with other	8	5.0
Services Subscription	Prepaid	83	52.2
	Post-paid	76	47.8
Internet Access	Very poor	5	3.1
	Poor	27	17.0
	Moderate	80	50.3
	Good	40	25.2
	Very Good	7	4.4
Internet Subscription Cost	Less than RM30	25	15.7
	RM31 - RM50	53	33.3
	RM51 - RM70	30	18.9
	RM71 - RM90	15	9.4
	More than RM91	36	22.6

Experiences and Challenges

The respondents were asked questions about the time allocated for studying, learning difficulties and family support during the pandemic as an indicator of the experiences and challenges during this study. From the results, most students allocated more than 6 hours (87/159, 55%) to study and completed the assignments rather than students allocated less than 6 hours (36/159, 22%). About 37% (59/159) of students said yes, they have difficulties in learning during the pandemic, the rest said no (5/159, 3%) and sometimes (95/159, 60%) for the experiences and challenges during the pandemic. For the family support during the pandemic, most students said that their family was very supportive (85/159, 54%), not supportive (13/159, 8%) and sometimes supportive (61/159, 38%) during the pandemic online learning. (Table 3).

Table 3
The Experiences and Challenges

	Experiences and Challenges	Frequency (n=159)	Percent
Allocation time to study	Less than 1 hour	1	0.6
	1 - 2 hours	5	3.1
	2 - 4 hours	14	8.8
	5 - 6 hours	16	10.1
	More than 6 hours	87	54.7
	Uncertain	36	22.6
Learning Difficulties	Yes	59	37.1
	No	5	3.1
	Sometimes	95	59.1
Family Members Support	Yes	85	53.5
	No	13	8.2
	Sometimes	61	38.4

Relationship between number of bedrooms and number of siblings

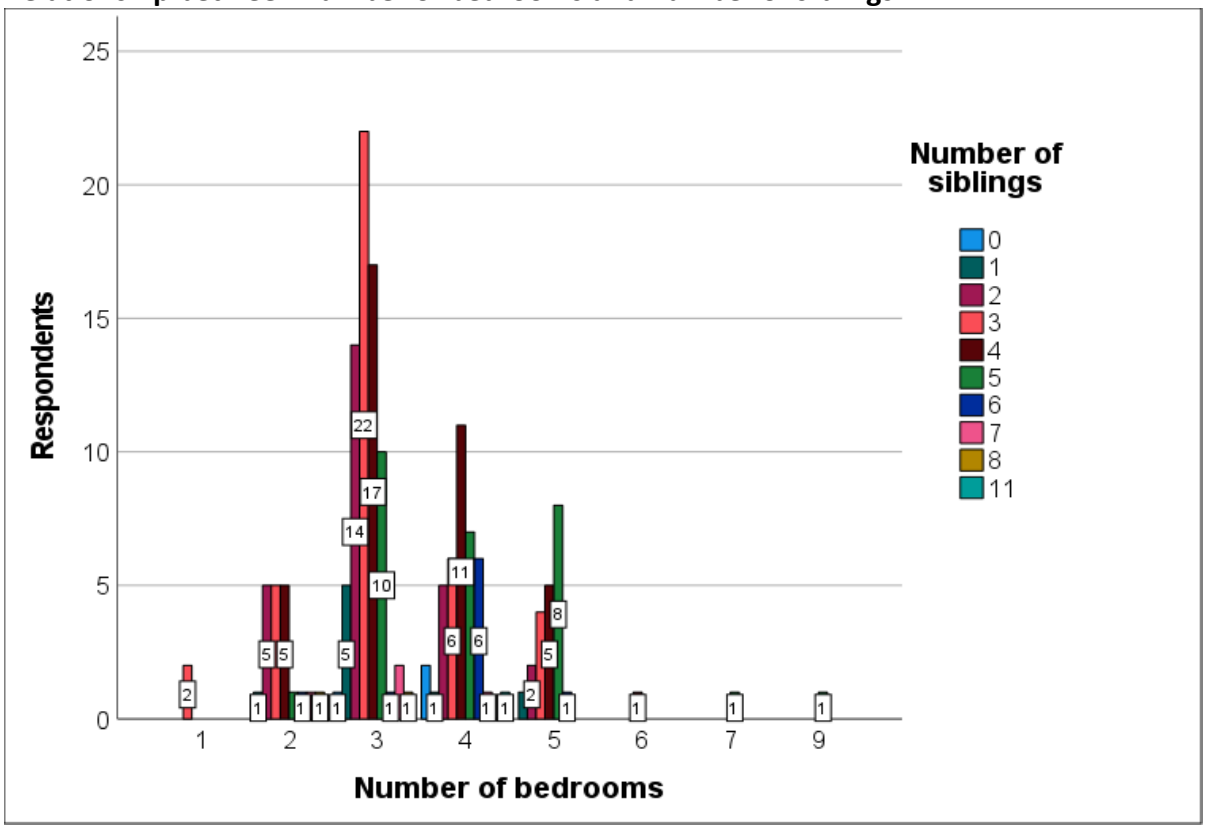

Figure 1.0: Relationship between the number of bedrooms and number of siblings

The experiences and challenges faced by the respondents were analysed by the statistical analysis system for SPSS to determine the significant interaction between variables which include living area, number of bedrooms, number of siblings, study allocation time, learning difficulties, family support, internet access, internet subscription and living area. Figure 1.0 represents the relationship between two variables which are the number of bedrooms and the number of siblings. According to this finding, it is reported that 1.3%, 12.6%, 45.9%, 25.2%,

13.2%, 0.6%, 0.6% and 0.6% of the students consist of 1, 2, 3, 4, 5, 6, 7 and 9 bedrooms respectively. Most of the students recorded 3 bedrooms which comprised 3 siblings in their family. Further, the analysis shows that 2 students have only 1 bedroom with 3 siblings. Also, it is highlighted from the data that the students had 2 bedrooms with more than 4 siblings and 4 bedrooms with 11 siblings. Based on this finding, it is indicated that some students were experiencing their own personal issues related to their home environment that could have distracted their participation in the online classes. The issue could lead the students to feel unmotivated because of their responsibilities at home as reported by (Ag-Ahmad, 2020).

Relationship between Study Allocation Time and learning Difficulties during MCO

Figure 2.0 shows the graphical representation on the relationship between study allocation time and online learning difficulties during MCO. It is noteworthy that most students spent more than six hours online learning. While, in term of online learning difficulties during MCO, the students sometimes had the problem of participating in online class for more than 6 hours. Only about 22.64% of students agreed and 2.52% of them had no difficulty doing online learning for a similar case. Moreover, it can be observed that 0.63%, 1.26%, 2.52%, 1.26% and 8.81% of students reported less than 1 hour, 1-2 hours, 2–4 hours, 5–6 hours and uncertain about spending their online learning time respectively. Thus, this finding is possible due to the students had no online education experience in comparing traditional classrooms. The reason agrees with the study conducted by Wenceslao and Felisa (2021), who claimed the sudden shift to online education at a large scale on short notice would certainly face difficulties and problems. Their work also addressed that online learning provides a higher level of flexibility to students where they take responsibility for their time, their learning needs, their learning goals and strategies leading to motivation and self-discipline in the students' online learning process.

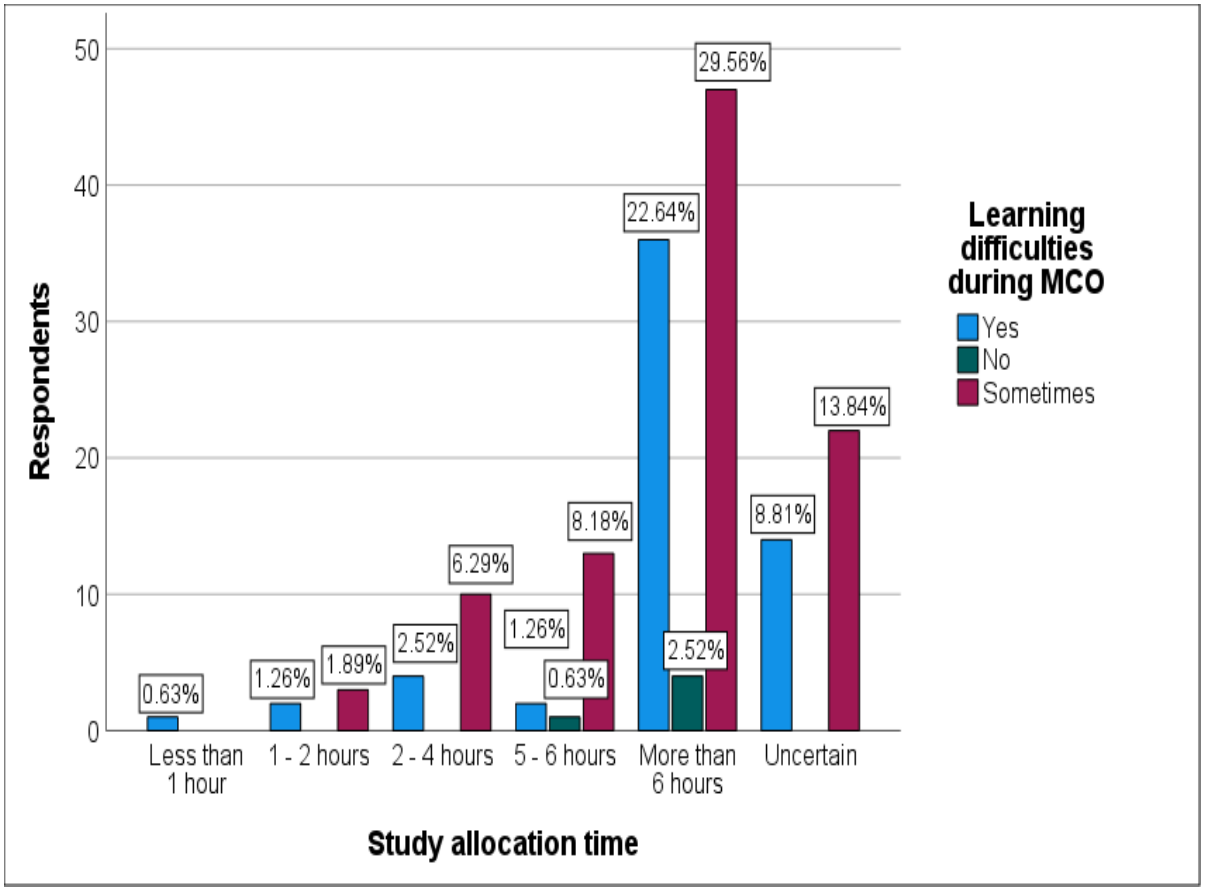

Figure 2.0: Relationship between study allocation time and learning difficulties during MCO

The relationship between study allocation time and family members providing support during MCO

The interaction of variables between study allocation time and family members providing support during MCO is illustrated in Figure 3.0. As can be seen, the finding obtained shows that 28.30% of students spent their time online learning for more than 6 hours with support from family members. While 22.01% of students recorded sometimes had support from family members and only 4.40% of students indicated they had no support from them after more than 6 hours of online learning. From this result, it is believed that some students felt stressed and unmotivated because there are a lot of distractions at home, leading to more time needed in completing tasks given during online learning. This is a tremendous experience and challenge faced by the students in their midst of trying to survive getting infected by the pandemic and continue with online learning from the comfort of their homes.

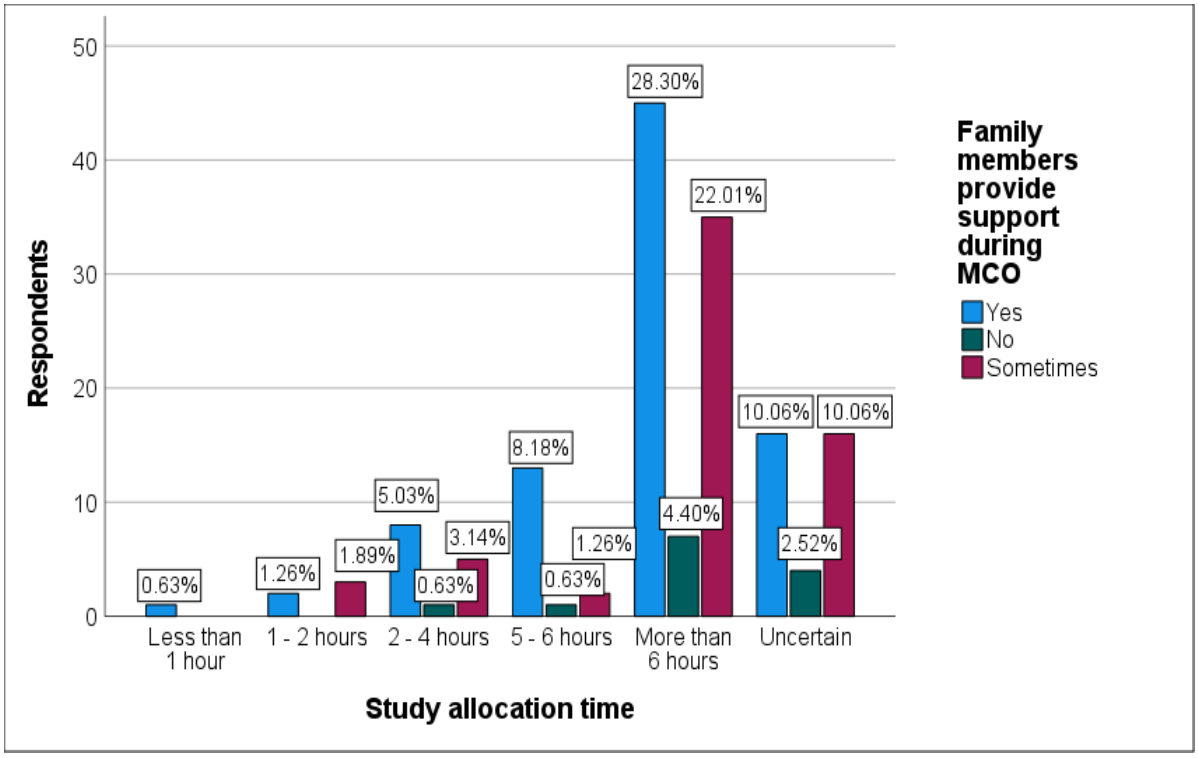

Figure 3.0: Relationship between study allocation time and family members providing support during MCO

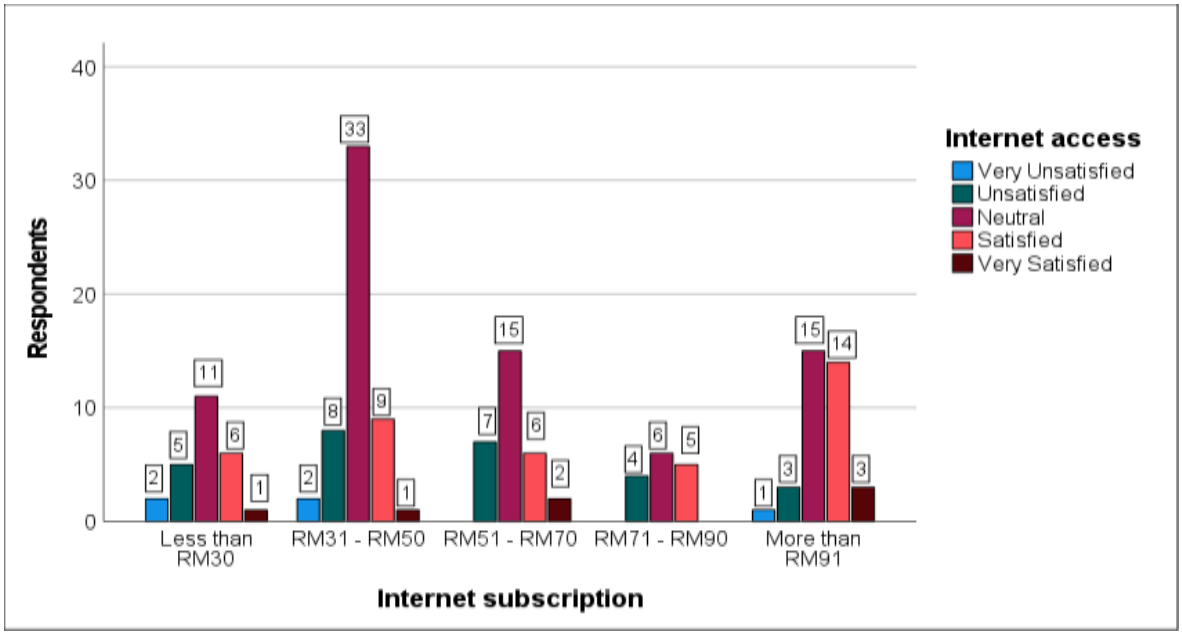

Figure 4.0: Interaction between internet subscription and internet access

Relationship between Internet Subscription and Internet Access

Figure 4.0 presents the graphical relationship between internet subscriptions and internet access among the students. Likert scale was used to investigate the extent to which they were satisfied with their internet access. While the internet subscription was measured in terms of less than RM30, RM31–RM50, RM51–RM70, RM71–RM90 and more than RM91. The analysis recorded 53 of the total 159 students had subscribed RM31–RM50 internet service, with 33 students reported neutral satisfaction for internet access. From the data obtained, it is clearly

shown the majority of students had limited internet access for each service of internet subscription. Only 15 students were subscribing RM71–RM90 for internet service. This finding is possibly due to the higher cost of internet subscriptions for online learning (Assareh & Bidokh, 2011).

Relationship between Study Allocation Time and Internet Access

The descriptive analysis demonstrated that the students mostly spent more than 6 hours of descriptive online learning as seen in Figure 5.0. About 38 of 159 total students agree with neutral satisfaction for internet access during their online learning time (more than 6 hours). Meanwhile, the results showed most students were very unsatisfied with internet connection when studying for less than 6 hours. In terms of internet access, no students were very satisfied with learning for less than 4 hours. This indicates that the students really had a problem of it with internet access during their online learning. We must understand the impact of e-learning on individual performance and the role of digital literacy (Mohammadyari & Singh, 2015; Assareh & Bidokh, 2011).

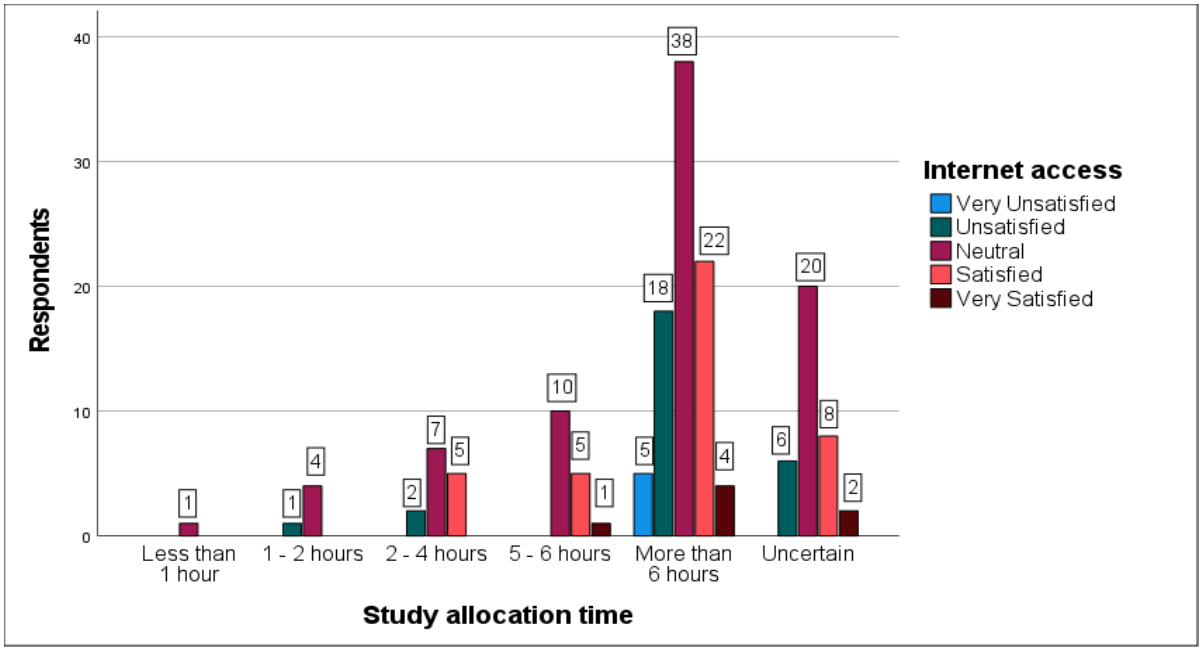

Figure 5.0: Interaction between study allocation time and internet access

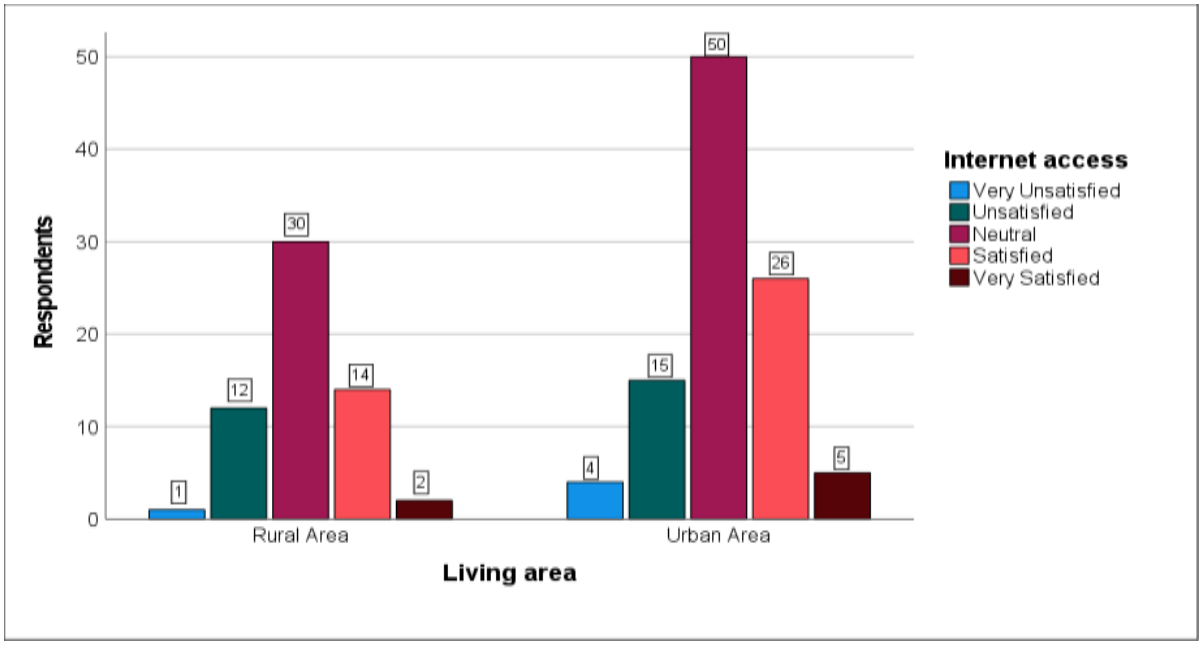

Figure 6.0: Interaction between the living area and internet access

Relationship between the Living area and Internet Access

Eventually, Figure 6.0 depicts the interaction between the living area and the internet access of students. The result found that both students that stayed in rural and urban areas recorded neutral satisfaction related with internet connection. While only two and five of the total students claimed very satisfied with internet access for living in rural and urban areas respectively. This data analysis revealed that 26 students who lived in urban areas felt satisfied in comparison with rural areas. According to Ag-Ahmad (2020), students' personal issues and unstable internet connections partly contributed to the effectiveness of online education.

Discussion

The majority of the students taking Civil Engineering Studies (CES) and taking the CEM courses are female (57%) and about a total of 63% of students live in an urban area. Among them, only 23% of students have more than five people while about 86% of students' residences have more than three bedrooms. It is considered to have a relatively comfortable space to study, do an assignment, do the online class at home and relaxing during a pandemic. Thus, the students can focus on studying because there is less interruption from family members and have enough space to do the activity at home. However, the majority of students come from the B40 (69%) family whose household income was less than RM5000 during the pandemic. It can be a personal challenge faced by the students. Personal challenges identified by the respondents are poor time management, increased stress, lack of self-discipline, lack of motivation and lack of financial resources for internet connection (Wenceslao & Felisa, 2021). These challenges are the common challenges during traditional classroom education (face to face), but it is a bigger concern during pandemics because it is an online education and student-centered learning is applied comprehensively.

For the online learning process, the most important things are the devices and the internet connection. The results showed that 93% have their own computer and only a minority do not have a computer or share these devices with their family members for learning during a pandemic. However, only 30% of the students stated that their internet

connection was good and very good, while about 70% of the internet access was very poor, poor, and moderate speed. These findings find that it is very challenging for students to learn and focus because internet access is often too disrupted and slow. Most students spend about more than RM50 on internet connections during the pandemic. This illustrates that technological difficulties such as learning aids like computers as well as poor internet access and unconducive learning space will affect students focus to learn better. According to Do (2020), Technology difficulties like unfamiliarity with new software applications, slow internet speed, poor signal coverage, audio and video communication problems, and poor technology infrastructure are the challenges in this category. These challenges include the experience of students to use unfamiliar software applications and teaching tools methods resulting in the maximum internet data needed to be provided.

Further, this study states that most students (53%) allocate time to study and complete the assignment in excess of 6 hours a day, which is a very long-time allocation. Even though CEM only has two credit hours, the element of assessment is quick a lot which is the element of the final examination, test, individual assignment, and a group project that are done on an online platform. This situation gave some pressure and difficulty to the student who faced internet access problems and the lack of a personal computer to review lessons and complete assignments. Students are motivated and interested in learning because family members are very supportive and helpful in facilitating their learning even when it is completely online. However, there are a few (8%) family members who do not understand the situation or learning difficulties faced by students.

Conclusion

In general, the purpose of this study is to identify and evaluate the impact of the pandemic on the teaching and learning process through the perception of university students. The influence of the pandemic on the teaching and learning process was identified and assessed using two types of criteria: experience and challenge. As a result, during the pandemic, students deal with a variety of problems and difficulties associated with the online teaching and learning process. As a result, the following effects of the epidemic on students have been determined by this study: (1) During the pandemic, they will need a comfortable place to study, complete assignments, attend home-based online classes, and rest. (2) Internet access that is slow and frequently interrupted. (3) Spending more than six hours per day studying and completing assignments. Consequently, during online classes, students experienced the effects of the pandemic's online teaching and learning process, including boredom, a loss of enthusiasm in learning, a lack of focus, a lack of communication between the teaching staff and even among friends, and so on. Therefore, it is necessary to improve the communication between teaching staff and students in online classrooms in order to increase student interest in taking online courses. This will also help students better understand the subject being taught.

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