

# SYNCHRONOUS AND ASYNCHRONOUS ONLINE DISTANCE LEARNING: PART TIME DIPLOMA IN ENGINEERING STUDENTS LEARNING PREFERENCES

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**ABSTRACT** - Over the years, UTMSPACE has been established for various forms of distance learning programmes that have helped realise the educational aspirations of students who could not attend the full-time mode of study. Distance learning refers to courses that are studied without the need to be physically present at the campus. Synchronous and asynchronous are two main types of distance learning. This paper highlights part-time engineering students' preferences in online distance learning and evaluates those impacts in their virtual mode of classes. The synergy between quantitative and qualitative methods is applied in this research. To understand student opinions of synchronous and asynchronous online learning, questionnaires had been distributed. To support the survey data, the interview was conducted for three engineering courses by individual and focus groups. From the analysis, four factors emerged as contributing to part-time engineering students' preferences regarding online distance learning: students' access system to learning materials, strength and weakness aspects of online learning interaction, the nature of subjects, and students' time management. The most crucial result of this study is that the participants seemed to be preferring a combination of synchronous and asynchronous learning methods, which is suitable for their positions as full-time employees.

**Keywords:** Online Distance Learning, Part Time Engineering Students, Synchronous and Asynchronous Learning

## 1. INTRODUCTION

As Malaysia is rapidly transforming into a knowledge-based nation, the development of continuing education is needed to accommodate its increasing demand for skilled personnel in the construction and manufacturing industry. Many full-time workers take distance courses due to work and social schedules; they prefer the flexibility of engaging in their educational experiences in settings of their preference to complete their engineering studies. UTMSPACE, as the subsidiary company under Universiti Teknologi Malaysia (UTM), premier

university in engineering and technology in Malaysia, offers part-time mode of studies for such individuals. According to Madden and Jones (2017), distance learning refers to courses that are studied without the need to be physically present at the campus [1]. Since 2017, UTMSPACE has been practising a blended learning, the combination both online and face to face learning experience. Due to the COVID-19 pandemic, UTMSPACE has transformed the traditional method of study from face-to-face weekend classes to more flexible online learning [2].

Universities and colleges are increasingly embracing new technologies and leveraging them, not only to enhance their traditional curriculums but also to extend course offerings beyond the college campus. Conventional face-to-face learning, which had been practiced at UTMSPACE for part-time students, has been transformed into online learning via synchronous and asynchronous methods. The opportunities to increase interaction between part-time students and UTMSPACE will be created based on the previous research, which has shown the positive benefits of informal student–faculty interaction outside the classroom, including higher levels of student satisfaction, retention and academic performance [3][4]. Students who have positive experiences are more likely to re-enrol in online courses in the future, so an institution that seeks to increase online enrolment would benefit from such information. Data on part-time engineering student experiences can also provide information to help institutions and faculty to design and deliver better online engineering courses, which could help improve engineering students’ learning in these courses. Such data could also help determine what challenges students face in the online mode of learning, which could in turn improve persistence and retention in online courses.

The aims of this study were to determine students’ preferences on two forms of learning interaction (synchronous web-conferencing and asynchronous) while keeping learning strategies consistent across each method. This was to find out how these strategies influence learner motivation and self-regulation, social presence, satisfaction and learning process and outcomes in small, interactive and collaborative online courses. Some questions on this study seeks to address are as follows: What is the impact of different communication methods on student and lecturer’s online interaction? Does this vary depending on internet speed and coverage or any other specific function? These questions go beyond the mere forms of identity presentation on Blackboard and aim to measure the effectiveness of teaching and learning by synchronous and asynchronous methods.

## **2. MATERIALS AND METHODS**

The participants of this study consisted of 77 students. They were enrolled in three main engineering courses in the diploma level at UTMSPACE, Kuala Lumpur, on the part-time basis. Students were varied in terms of their age, socioeconomic status and work experiences in the public and private sector. More than 80% of them were male students. Data on current active students were obtained from the Centre of Part-Time Studies, UTMSPACE, Kuala Lumpur.

### **2.1. Communication to Facilitate Student–Faculty Interaction – Synchronous or Asynchronous**

The most common forms of communication used by faculty to facilitate interaction with students include the use of asynchronous (e.g. email and online discussion boards) and synchronous communication (e.g. chat or instant messaging). Most of the research related to the use of asynchronous communication in higher education has focused on distance learning courses that utilise web-based communication technologies to deliver course content virtually, thus involving extensive student–instructor communications [5]. Synchronous online communications have been used with success in several studies of distance learning environments [6]. The most common forms of such communication are “chat” or instant messaging. In a comparative study of synchronous and asynchronous learning technologies, found that synchronous chat created a feeling of community among students enrolled in a graduate course [7]. Previous study conducted a field study of synchronous chat in an online course and found the student satisfaction to be highest in courses where synchronous chat sessions were offered in addition to face-to-face methods. This finding was consistent with study, which also found the “chat” function of commercial course management systems less effective for more in-depth topics [8].

### **2.2. Research Design**

The mixed methodology, involving quantitative as well as qualitative research, has been applied in this research, as it is believed that both are important in understanding students’ satisfactions. In this study, the literature review covered the synchronous and asynchronous implementation on distance learning according to three settings on the academics assist. The two-stage sequential mixed-methods study aimed at obtaining qualitative results from focus group discussions and in-depth interviews with participants in a targeted group, which was followed by the statistical quantitative results [9].

**3. RESULTS AND DISCUSSION**

**3.1. Online Learning Information**

This study classifies into three (3) categories; Synchronous learning method limited to web conferencing by using Blackboard Collaboration, Webex and Google Meet. Asynchronous method; pre-recorded video, Whatsapp and email; Combination of synchronous and asynchronous learning method. The findings demonstrate that 2 (2.6%), 17 (22.1%), 49 (63.6%), 3 (3.9%), 4 (4.2%) and 1 (1.3%) participants used desktop, laptop/notebook; laptop/notebook, smartphone; laptop/notebook, tablet, smartphone; PC desktop; smartphone and tablet; and smartphone, respectively. Only 1 out of 77 respondents using the combination of tablet and smartphone in the virtual learning. With respect to the type of internet access, 29 (37.7%) used cellular phone/mobile data, 16 (20.8%) used Fiber to home, 2 (2.6%) used Wi-Fi, broadband, cellular phone/mobile data, 3 (3.9%) used Wi-Fi, cable modem, cellular phone/mobile data, 2 (2.6%) used Wi-Fi, cable modem, Fiber to home, cellular phone/mobile data and 25 (32.5%) used Wi-Fi, cellular phone/mobile data to access internet. Essentially, 44 (57.1%), 13 (16.9%) and 20 (26%) of the participants answered ‘yes’, ‘no’ and ‘not sure’ to whether online learning can give a positive learning experience.

The results of the analysis indicate that 10 (13%) and 41 (53.2%) of the participants perceived good content delivery using online learning method and instructor as the approach that can increase positive vibes during online learning. Furthermore, 8 (10.4) and 18 (23.4%) of the participants indicated learning activities and others as the method that can increase positive vibes during online learning. Table 1 illustrate in details of the respondent’s information in using the typical digital device. Figure 1 shows the frequent type of internet access used by the participants when reaching out the online learning.

**Table 1.** Online Distance Learning Information

Internet	n	%
<b>Type of digital device</b>		
Desktop	2	2.6
Laptop/Notebook	17	22.1
Laptop/Notebook, Smartphone	49	63.6
Laptop /Notebook, Tablet, Smartphone	3	3.9
PC Desktop	1	1.3
Smartphone	4	5.2
Tablet, Smartphone	1	1.3

**Types of internet access**

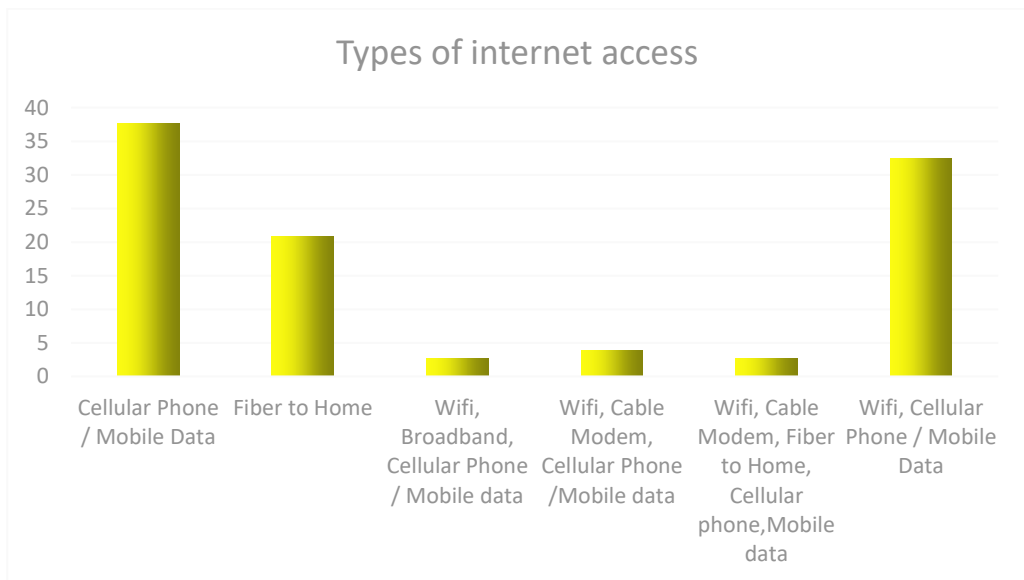
Cellular Phone/Mobile Data	29	37.7
Fiber to Home	16	20.8
Wi-Fi, Broadband, Cellular Phone/Mobile Data	2	2.6
Wi-Fi, Cable Modem, Cellular Phone	3	3.9
Wi-Fi, Cable Modem, Fiber to Home, Cellular Phone/Mobile Data	2	2.6
Wi-Fi, Cellular Phone/Mobile Data	25	32.5

**Do you think that online learning can give a positive learning experience?**

Yes	44	57.1
No	13	16.9
Not Sure	20	26.0

**What do you think can increase positive vibes during online learning?**

Content delivery using media	10	13.0
Instructor	41	53.2
Learning activities	8	10.4
Others	18	23.4



**Figure 1.** Type of Internets Access

**3.2. Research Question 1: How do working day and income impact their online learning as part-time students?**

A better understanding for part-time students to feel connected to UTMSPACE and what their online learning expectations are to remain at their learning institution will influence their success and decisions. The demographic data, as shown in the Table 2, were obtained from questionnaires to enhance the interpretation of the results. About 18 participants (23.4%) had shift rotation working day, and 16 students (20.8%) had to commit for the job six days per weekend, whereby the time does not tally with classes on weekend schedules, causing the students to be underprepared.

For distance learning students, online courses offer them an opportunity to access the course without boundaries. Majority of part-time learners’ ages range between 30 and 39 years, and they are in the peak of their professional careers. They have limited time to focus on weekend classes through semesters. Moreover, with less credit taken compared to full-time students, the duration of completing the course is often much longer. However, students cite flexibility and convenience as primary advantages of online learning. These features make online courses particularly valuable to adults with multiple responsibilities and highly scheduled lives. Thus, online learning can be a boon to workforce development, helping people who have to cope with adult responsibilities to return to higher institution and complete additional education that otherwise could not fit into their daily routines. The flexibility of online learning would be a strategy that is thought to contribute to the relatively high graduation rate for part-time students.

**Table 2.** Student demographic profile

<b>Demographic Profile</b>	<b>n</b>	<b>%</b>
<b>Gender</b>		
Male	66	85.7
Female	11	14.3
<b>Age (years)</b>		
20 to 29	29	37.7
30 to 39	36	46.8
40 to 49	10	13.0
50 above	2	2.5
<b>Programme</b>		
Diploma in Civil Engineering	32	41.6
Diploma in Mechanical Engineering	13	16.9

Diploma in Electrical Engineering	32	41.6
<b>Normal working day</b>		
Mon to Fri	43	55.8
Mon to Sat	16	20.8
Shift Rotation	18	23.4
<b>Income</b>		
B40 (Less than RM 4849)	34	44.2
M40 (RM 4850–RM 10959)	33	42.9
T20 (> RM 10959)	10	13.0

### 3.3. Research Question 2: What made their experience with the online communication method (synchronous and asynchronous) satisfactory or unsatisfactory?

#### 3.3.1 Descriptive Analysis

Beginning with the quantitative approach, the responses of the participants indicate that a large percentage of them agree that they enjoy learning from synchronous lectures, as indicated by the mean of  $4.23 \pm 0.93$ . However, as Table 3 shows, the participants gave a neutral response with respect to statements B10, B11, B12 and B13, as evident by the neutral mean of  $3.90 \pm 0.88$ ,  $3.61 \pm 1.08$ ,  $3.88 \pm 0.86$  and  $3.48 \pm 0.88$ , respectively. Moreover, a large section of the participants agree that they are satisfied with the online assessments that students need to undertake in real time, such as quizzes, tests and exams, as indicated by the above-average mean of  $4.00 \pm 0.84$ . Conversely, the participants gave a neutral response with respect to statements B15, B16, B17, B18 and B19, as illustrated by the neutral standard deviation and mean of  $3.48 \pm 0.91$ ,  $3.44 \pm 0.68$ ,  $3.48 \pm 0.93$ ,  $3.30 \pm 0.78$  and  $3.48 \pm 0.98$ , respectively.

**Table 3.** Synchronous vs Asynchronous Online Learning Experience

No	Statement	SD		D		N		A		SA		Mean	SD
		n	%	n	%	n	%	n	%	n	%		
B9	I enjoyed learning from synchronous lectures			4	5.2	14	18.2	19	24.7	40	51.9	4.23	0.93
B10	The amount of interaction SYNCHRONOUSLY with instructor/lecturer is adequate			7	9.1	13	16.9			19	24.7	3.90	0.88
B11	The amount of interaction with classmates is adequate (SYNCHRONOUS)	5	6.5	5	6.5	20	26.0	32	41.6	15	19.5	3.61	1.08
B12	I do understand learning by SYNCHRONOUS method			6	7.8	15	19.5	38	49.4	18	23.4	3.88	0.86
B13	I believe that learning SYNCHRONOUSLY using the internet is easier	1	1.3	12	15.6	18	23.4	41	53.2	5	6.5	3.48	0.88
B14	I am satisfied with the online assessments that students need to do in real time, such quizzes, tests and exams (SYNCHRONOUS)			3	3.9	18	23.4	32	41.6	24	31.2	4.00	0.84



B15	I enjoyed learning from asynchronous lectures	1	1.3	8	10.4	32	41.6	25	32.5	11	14.3	3.48	0.91
B16	The amount of interaction with instructor/lecturer is adequate	1	1.3	4	5.2	33	42.9	38	49.4	1	1.3	3.44	0.68
B17	I do understand learning by ASYNCHRONOUS method	1	1.3	6	7.8	39	50.6	17	22.1	14	18.2	3.48	0.93
B18	The amount of interaction with classmates was adequate (ASYNCHRONOUS)	2	2.6	8	10.4	33	42.9	33	42.9	1	1.3	3.30	0.78
B19	I am satisfied with the online assessment that students need to do in real time such quizzes, tests and exams (ASYNCHRONOUS)	4	5.2	2	2.6	33	42.9	29	37.7	9	11.7	3.48	0.93

\*SD – Strongly Disagree

D – Disagree

N – Neutral

A – Strongly Disagree

SA – Strongly Agree

The integration of quantitative and qualitative data collection and analysis in this study effectively facilitates a triangulation to fulfil the objectives with saturated and rigid feedback from respondents, thus reinforcing the conclusions. To support the survey data findings, the interview was conducted for a focus group from three engineering courses; it is a guided discussion that systematically investigates what a diverse group of people think of a set of research questions. The interview transcriptions were made by interpretation of themes and categories as shown in Table 4.

**Table 4.** Code/category triangulation schedule between study participants

No.	Theme/Category/ Sub category	ES 1	ES 2	ES 3	ES 4	ES 5	ES 6
1	Satisfied						
1.1	Synchronous						
1.1.1	Classroom engagement	√	√	√			
1.1.2	Deep interaction	√	√		√	√	√
1.2	Asynchronous						
1.2.1	Flexibility	√	√	√	√	√	√
1.2.2	Convenient for groupwork	√	√				
1.2.3	Level of understanding	√	√				√
2	Not satisfied						
2.1	Synchronous						
2.1.1	Fixed time	√	√	√			
2.1.2	Internet coverage	√	√				
2.2	Asynchronous						
2.3.1	Learning independently		√		√	√	√
2.3.2	Lack of communication		√				

\*ES – Engineering student

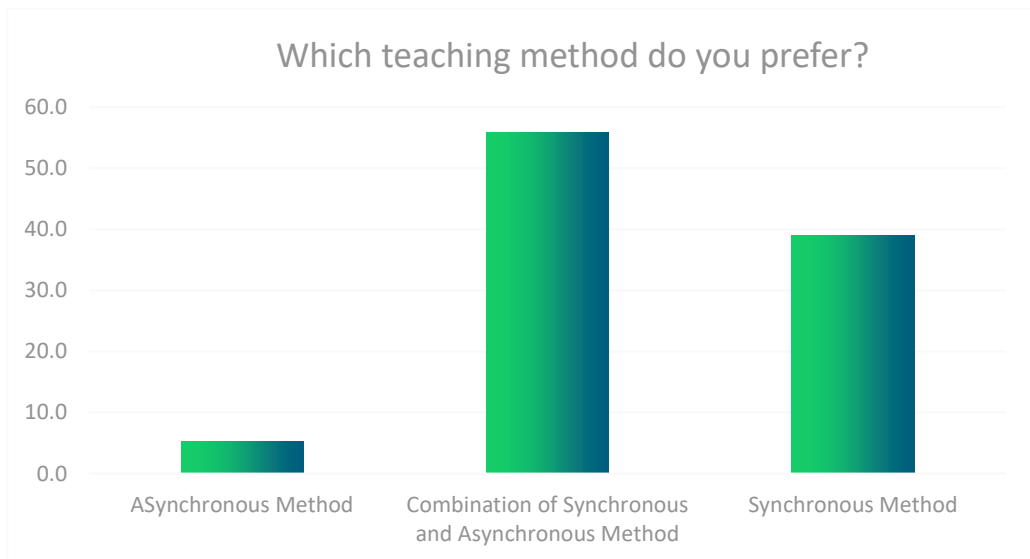
**3.4. Research Question 3: To what extent is the asynchronous learning method (pre-recorded lectures, WhatsApp and email) effective compared with the synchronous learning method (Blackboard Collaborate, Webex and Google Meet) to assist the students regarding their academic difficulties?**

To answer the third research question, participants were asked to select their preferences on distance learning method and describe the reason for their choice

by open-ended questions in the questionnaire. Results are summarised in Table 5. The findings below, as shown in Figure 2, indicate that 4 (5.2%) participants prefer synchronous interaction, while 43 (55.8%) prefer a combination of synchronous and asynchronous interaction and 30 (39%) prefer the asynchronous method of teaching.

**Table 5.** Percentages of students’ preference on type of online learning method

No.	Statement	n	%
B20	<b>Which interaction method do you prefer?</b>		
	Synchronous	4	5.2
	Asynchronous	30	39.0
	Combination of Synchronous and Asynchronous	43	55.8



**Figure 2.** Teaching method preference

The findings in Table 6 show how the participants rated the synchronous learning method, which is real-time lecturer–student interactions. Most said that synchronous interaction is more important, because active learning is encouraged when courses include individual and group assignments. Moreover, 30 out of 77 respondents (39%) expressed their perceptions on exact-time online classes. As Table 7 shows, 4 out of 77 (5.2%) respondents prefer the alternating time of class. Table 8 shows that 43 students frequently choose the combination of synchronous and asynchronous learning method. Analysis results shows 55.8 percent students

choose combination method in online learning. From previous study, the descriptive analysis results show that the Blended Online Learning (Synchronous & Asynchronous) category as high perception with value of 54.49 percent impacts on student’s interest [10].

**Table 6.** Open-ended question – synchronous learning method observation

<b>Why do you prefer the synchronous learning method?</b>	<b>n</b>	<b>%</b>
In-depth discussion	13	16.9
Real-time online learning as active learning, like being face to face with lecturer and classmates	7	9.1
Immediate answer from lecturer may be given	4	5.2
With proper learning system, students can chat with other groupmates	2	2.6
Mixing with classroom members and virtual modes of lectures	3	3.9
Need online classes at least 1–2 times per month	1	1.3

**Table 7.** Open-ended question – asynchronous learning method observation

<b>Why do you prefer the asynchronous learning method?</b>	<b>n</b>	<b>%</b>
Extra notes and proper pre-recorded lectures, especially calculation examples	2	2.6
Lecturer available to assist students via WhatsApp and email	2	2.6

The asynchronous method (pre-recorded lectures) for calculation topics and immediate feedback from lecturers on the difficulties raised via WhatsApp and email has been quite advantageous for distance learners. Core engineering topics related to calculation are the most critical part. Thus, they need extra guidance from the lecturer asynchronously.

**Table 8.** Open-ended question – combination learning method observation

<b>Why do you prefer the combination learning method?</b>	<b>Frequency</b>	<b>%</b>
I prefer to conduct from 8 pm onward on weekdays (Monday–Friday), try to save in recording, upload into BB for students to refresh back for self-study	5	6.5

Doing a lot of tasks that can improvise our knowledge in application or industrial	3	3.9
Time constraints due to uncertainty in working time/shift	12	15.6
It is good to do pre-recorded classes, because most probably we are working on Saturday. Prefer real-time classes on Sunday	1	1.3
We can reduce the cost of transportation and accommodation during the course with online learning	5	6.5
Video lecture before class so that those students may review before online class begins	13	16.9
Need to combine both methods so that it does not burden the students since we have to be static in front of the PC and laptop most of the day. It causes students to be less focused. It will also be burdensome, especially for subjects involving calculations. Upload the recording video in the BB, so students can review at their convenient time later	4	5.2
<b>Total</b>	<b>77</b>	<b>100.0</b>

While it is clear synchronous interaction is playing a larger role in the online learning environment, asynchronous interaction still has its place in distance education (Watts,2016) [11]. This study was designed to examine students' experiences and factors of the preferred method in online learning. To get the exact factors with saturated data in analysis, the interview was done by telephone and transcribed. According to Marshall and Rossman (2006), when a researcher combines transcribed interview data with an initial analysis of data, it allows for more efficiency and reflection in data analysis. Points of view have been extracted as follows:

*Engineering Student 1*

I prefer synchronous online learning. The virtual whiteboard with screen sharing function and enable the instructor to set up a web conference with students for better real time learning. Sometimes they could turn to asynchronous learning; recorded lectures on a series of subtopics related to the course information. However, we did not get instant feedback from the instructor by pre-recorded

lecture, so we urge use other mediums such as instant messaging, WhatsApp and talking on the phone. Nonetheless, the asynchronous learning method is convenient, especially when I'm on an outstation. There's no issues of internet coverage. There is a day I need to complete my work which I requires going to the office; therefore I might use the Wi-Fi provided in my workplace.

### *Engineering Student 2*

Live sessions are much better. There is two-way communication instead of recording lectures with one-way communication. For example, in the environmental engineering subtopics, which cover the mathematical basis of studies, I prefer pre-recorded lectures. But for civil engineering materials for this semester with full theoretical subjects, the live session should be no problem for me. I prefer the percentages of synchronous/live sessions which involve two-way communication. Any inquiries on the topic which I couldn't understand I might ask directly to the instructor/lecturer.

Recording lectures on complex derivation topics would be helpful. The low internet connectivity in certain areas will interrupt me, so the asynchronous session would be a great solution. I may refer to the important points given by the lecturer. I prefer Blackboard Collaborate, because I manage to play the recording lecture anytime and anywhere without having to ask for the link or permission from the lecturer. Blackboard is convenient and user-friendly compared to other types of video conferencing, such as Google Meet and Webex. It is awkward for the first semester, maybe because we are not seeing each other face-to-face. But for the second semester, we get to know each other thoroughly and we can meet up outside the campus.

## **4. CONCLUSION**

The implications of student experiences on synchronous and asynchronous online learning interaction method can be summed up as follows:

- Learning materials uploaded on the online learning platform should be organised and accessible anytime and anywhere, in case they need to go outstation on their job.
- Technical difficulties can be particularly frustrating for students who are working under time pressure to turn in homework, complete quizzes and exams or participate in discussion sessions and take notes from streaming video lectures.

- Since they are full-time employees and tied to the working schedule, asynchronous interaction with recording video and immediate guidance on the academic difficulties from lecturers are beneficial, notably for calculation-based subjects.
- Asynchronous interaction has been an important learning support to promote active synchronous participation in distance learning, whereby students prefer less time on screen and ensure to insert moments of break between presentations in real-time classes to stay in focus.
- Students should be given ample opportunity in synchronous learning to communicate with lecturers and classmates on inquiry topics to improve their understanding and enhance their performance.

Four factors influencing part-time engineering students' preferences on online distance learning are as follows: students' accommodation access to learning materials, strength and weakness aspects of online learning interaction, the nature of subjects and students' time management. The findings revealed that most part-time engineering students choose the synchronous learning method, but due to the limitation of time as a full-time employee, they tend to find their own schedule and the exact time to learn, particularly for calculation-based subject, where the asynchronous learning method would be beneficial to them. Hence, a combination of synchronous and asynchronous learning method gives distance learners satisfaction and success in an online learning environment as well as ample strategy that contributes to the university's relatively high part time mode of student's graduation rate.

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## **REFERENCES**

[1] Madden, L., & Jones, G. (2017). Teacher education: Modes of communication within asynchronous and synchronous communication platforms. *Journal of Classroom Interaction*, 52, 2 p16-30

- [2] Fatimah Mohd Noor & Noor Azidah Ahmad., (2012). Continuing Education for Professional Development at UTMSPACE - Experience, Development and Trends. International Conference on Teaching and Learning in Higher Education (ICTLHE2012).
- [3] Cotten, S. and B. Wilson., (2006), Student-faculty Interactions: Dynamics and Determinants, *Higher Education*, 51, 4, pp. 487-519
- [4] Nadler, M. K., & Nadler, L. B., (2000). Out-of-class communications between faculty and students: A faculty perspective. *Communication Studies*, 51(2), 176–188.
- [5] Eric S. Belt & Patrick R. Lowenthal (2021) Video use in online and blended courses: A Qualitative Synthesis, *Distance Education*, 42:3, 410-440, DOI 10.1080/01587919.201
- [6] Myers, S., Bishop, D., Sayee, S., and Kelly. J., (2004), Virtual Office Hours: Tutoring Students in Statistics and Economics. Proceedings of the OCDE Convergence of Libraries
- [7] Schwier, R. A., and S. Balbar., (2002). The interplay of content and community in synchronous and asynchronous communication: Virtual communication in a graduate seminar. *Canadian Journal of Learning and Technology* 28 (2): 21-30.
- [8] Cox G, Carr T and Hall M., (2004), Evaluating The Use Of Synchronous Communication In Two Blended Courses, *Journal of Computer Assisted Learning*, 20 (3), 183-193
- [9] Marshall, C., & Rossman, G. B., (2006). *Designing qualitative research* (4<sup>th</sup> ed.). Thousand Oaks: Sage Publication.
- [10] H.H Arfan, Misnawati, G. Sakkir, N. Puspita, Z. Akbar and Yusriadi (2019), Student learning interest in COVID-19 pandemic age by blended e-learning (Asynchronous and synchronous). 11th Annual International Conference on Industrial Engineering and Operations Management, IEOM 2021 ; : 6330-6339, 2021.
- [11] Watts, L. (2016). Synchronous and asynchronous communication in distance learning: A review of the literature. *Quarterly Review of Distance Education*, 17(1), 23–32