How the preferences of students change on online learning from transition term to during the Covid Pandemic period

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Abstract: - The developments in the communication and Internet technologies have had a major impact on education. The traditional face-to-face education has changed substantially with the advancement of technology. With the start and ongoing Covid pandemic, face-to-face education has been replaced with online education. In this paper, an empirical study was undertaken to examine the change of students' preferences for online education versus traditional education and the supporting learning technologies such as Learning Management System (LMS) between the two periods: transition term (TT) and ongoing Covid pandemic (DC). Results showed that there is a difference in the students' preferences when compared with gender and number of online courses taken but there are not statistically significant. Research findings support the fact that students were not ready for a fully online education even though they had experience with online learning. The grade distribution of students decreased from TT to DC due to self study and online assesments with proctoring. Students agreed that traditional courses increased their learning and the learning technologies, such as LCM, online platforms and VTC help them learn the materials online in both TT and DC. For online learning, they prefer synchronous courses to asynchronous courses.

Key-Words: - Covid-19 Pandemic, Online education, Traditional education, Preference of students.

1 Introduction

Rapid growth of technology has changed every aspect of life today, including our education system. Technological innovations like internet, computer, cell phone etc., have brought the traditional face-to-face education in different platforms since the beginning of the 80s. First, computers integrated to education, then by the innovation of internet, online education started to emerge. Over the years, the offering of courses and programs online by universities are growing in popularity. However, when the global lockdown caused major interruptions to the education system. Many universities are caught unprepared by the change. Besides, the Z generations were impacted even though they had taken some courses online, hybrid or traditionally. In the middle of March 2020, Covid pandemic lockdown has spread across the world. During this transition term, many universities suspended classroom teaching and switched to online teaching in order to continue education to minimize learning interruption [1]. However, the sudden change of mode has a negative impact on universities, instructors and students. None of them were ready for this sudden change. Most of the universities did not have enough technological infrastructure to support fully online education. Moreover, instructors must learn the technology in a short time to deliver the courses online.

Students were also negatively affected by the Covid pandemic. Although some of them took online courses before and they have growth into the technology, they still faced many difficulties while taking all courses online. Writing online exams with protracting, having internet problems, more time spending to study the materials, the lives of students have changed drastically. From the perspective of international students, their workload was doubled because they must continue the courses from their countries in different time zone.

There are many studies on the impact of Covid pandemic socially, psychologically, and economically. Since the Covid pandemic has been prolonged since March 2020, this paper explores how the students' preferences for online education has changed from transition term and into the Covid pandemic period.

The rest of the paper is organized as follows. Section 2 discusses relevant literature, then the section 3 describes the research goals and methodology. Section 4 reports the research findings and

conclusion. The last section summarized main results and highlight future work.

2 Literature Review

Education is a cornerstone of our life, and it is the backbone of a good prosperous nation [2, 3]. The traditional face-to-face education was the only option until the Open University was established in 1969 in England and started the education in 1971[4]. Then with the technological innovations in early 1980s, brought a new dimension to the education which has impacted our life. The developments in the communication and Internet technologies during the last three decades have had a major impact on education. The traditional face-to-face education has changed substantially with the new wave of technology innovation [5, 6]. Internet, smartphones, computers, audio or video added lecture slides, etc., have changed the in-class teaching style. In a short time, many universities, including leading academic institutions, have started to teach online courses and/or offer online programs [5, 7]. Online learning or e-learning can be experienced in synchronous (where learners meet in real-time) or asynchronous (where students interact at different times) environment using different devices such as mobile phone, laptops, etc, with internet access [8-10]. The popularity of online education, which is called virtual education or remote education, increased all around the world. According to the Babson Survey Research Report [5, 11, 12] by Fall of 2013, one in every eight students enrolled in college and universities in U.S. was studying completely online, and one in every four students took at least one online course. Again, according to the Babson Survey Research Group's latest report, by 2016, there were more than 6 million students in the U.S. enrolled in at least one distance education course, representing 31.6% of all students [5, 11, 13]. A report revealed that the percentage of students taking one or more online undergraduate classes increased from 15.6% in 2004 to 43.1% in 2016 [14]. The same report also showed that the percentage of undergraduate students taking fully online degree programs increased from 3.8% in 2008 to 10.8% in 2016. The number of students taking at least one online course grew from 31.1 percent in 2016 to 33.1 percent in 2017 and 34.7 percent in 2018 [14]. Besides the distance and online education, traditional face-to-face in class education kept its importance until the Covid-pandemic started in December 2019. The coronavirus (Covid-19) pandemic is an unprecedented emergency that has dramatically affected all global industries, including education [15, 16]. With the spread of Covid-19 globally in the middle of the March 2020, global lockdown was implemented and education institutions across all levels (from elementary to tertiary) have closed in 188 countries across the globe, impacting over 91% of the world's student population [15-17]. Around 1.7 billion learners are affected due to Covid-19 by temporally suspending their educational activities [2, 5]. As per the World Bank report (2020) several countries had adopted different learning styles to continue education to minimize learning interruption [8]. Most of the universities have shifted to either asynchronous or synchronous online education. During this transition term, not only the universities but also the instructors and students were negatively affected. In a short time period, millions of faculty members started to teach in front of a computer screen, and their students have to stay at home and take the courses through the internet [18]. Although most of the universities have online programs, they were not ready for the fully online or virtual education for this cardinal restructuring of the educational process based on different levels of development of the information infrastructure, the availability of disciplines with electronic educational resources and the willingness of teachers to use digital platforms and services in the educational process [19].

Universities: Most of the universities are using different software such as Learning Management Systems (LMS) for administration, course deliveries, assessments, or communication, it is not possible to deliver synchronous courses or live lectures with the existing LMS, like Moodle, Eclass, Brightspace, Blackboard, Canvas, WebCT, Sakai etc. Most of LMSs work using web servers in order to be accessible through Internet [20]. The main functions of a LMS are manage and register users, resources and formation activities, access check, control and monitoring learning process, doing evaluations, informs, managing communication services like forums [20]. To deliver live lectures, universities should make a new contract or extend their contracts with the different virtual tele-conferencing (VTC) platforms. The most popular VTCs are Zoom, Google Meet, Microsoft Team and so on.

Instructors: In order to utilize online approaches, educators must invest considerable time up-front to learn how to create online learning material. In many cases, instructors are required to develop these new skills and create or adapt resources in parallel with a time frame that reflects the normal progression of student learning [15]. In the current situation, when the transition to online learning was carried out as soon as possible, all these conditions would normally have been created in advance, and instructors would

have had experience using online learning tools and student support services before. Practice shows that the development of an online course takes an average of 6-9 months, and the instructor's working skills on an online platform are formed during the first two parts of the course. [11-16]. During the transition term, instructors adapted the syllabus to online format, taught students on how to use the Zoom platform, what basic requirements were needed in terms of internet connectivity (e.g. upload and download speeds, video camera, microphone, etc.), and internet etiquette for attending classes online (e.g. attendance and tardy policy, how to "raise one's hand" during the class, how to use break-out rooms for special activities, etc.) [19]. Some of them posted audio added or video recorded lectures to the LMS, some of them opted to replace lectures with recorded presentations and accompanying audio that was uploaded to the Virtual Learning Environment [15]. According to literature, thirty-six percent of universities also provided live sessions and tutorials via platforms such as "Zoom" (Zoom Voice Communications Inc., San Jose, CA), "Collaborate Ultra" (Blackboard Inc., New York, NY), and "Big Blue Button" (Big Blue Button Inc., Ottawa, Canada) [15]. During the transition term, the workload of instructors was at least doubled with preparing lecture slides, audio or video recording, holding online office hours, answering the questions in forum, and especially preparing assessments. In transition term (TT), some courses easily have been moved to online, but the difficulty arises for the courses which required science labs like art and science courses and engineering courses. For those courses, instructors must use special programs to deliver the labs with 3D effects. Beside these difficulties, test assessment is another problem that increase the workload for the instructors. In order to prevent students from cheating, they have to prepare many original questions in the question banks, for example, while preparing 10 questions in class test, they have to prepare at least 50 questions for an online test in order to create a pool of questions that are randomly assigned to students.

Old questions or publisher test bank questions cannot be recycled because students are making archive of the questions, sometimes they are sharing the questions on social media even if they are aware of the violation of academic integrity. Some instructors prefer to give take home exam, but it cannot be applicable for all courses, so they assess the students via LMS. In addition, due to students' characteristics of low concentration in online learning, it is essential to adjust the teaching speed in order to ensure the effective delivery of teaching information [18].

Since the Covid pandemic has been continued dramatically without pausing since March 2020 and all courses are offered online, it seems the instructors are still developing their skills and adapting themselves to the online education. They are encouraging students not to stop studying in the outgoing crisis rather use innovative ways of education instead of traditional methods to learn [2]. According to a survey which was conducted to study the preference of instructors in May 2021 if they want to return to traditional education, 82% stated that they preferred to continue online even though they are still facing many challenges teaching online due to Covid pandemic.

Students: Students have also negatively affected from Covid pandemic even though they are highly digital natives and use technology as an integral part of their everyday life where, they use technology widely for internet shopping, socializing, and communication [8, 21] According to a research about the students' perceptions before Covid (BC) and Transition term (TT), while students wanted to take online courses instead of traditional face-to-face courses before Covid pandemic, their preferences slightly changed in Transition term even though they have taken online courses before Covid pandemic [5]. They highly agreed that online education is easier than traditional education or students learn more in online education or they would recommend taking online courses instead of in class courses to a friend before Covid pandemic, but they all disagreed in transition term [5]. They were not ready to take all courses online. [5]. This sudden changed has negative impact on the students in different ways, such as more self-learning, leaving in different time zone, mental health problems, anxiety, etc.

In online learning, the lack of face-to face interaction and even having the live lectures for a large class size, it is difficult to learn the materials, so the students feel that they have to "teach" themselves the material or even question the role of the instructor of an online course [22]. Self-discipline is required for online learning due to a lack of supervision from instructors. Study has shown that students' degree of self-discipline increases with their maturity [8, 23]. In addition, the broader economic impacts of COVID-19 have led to significant numbers of students experiencing hardship, including international students that are stranded in their country of study throughout the pandemic [8]. In the Covid-19 crisis, synchronous teaching may be deemed unsuitable for some students especially students living in different time zones or those with parental and caregiving responsibilities [15]. Moreover, previous studies have shown that a decrease in quality of life and

experiencing a high stress level would negatively affect students' motivation and academic performance [15, 24, 25]. According to a research, majority (66.7%) of the students have experienced anxiety because of this pandemic. Similarly, females experienced a higher level of anxiety than males [26]. Reduced social interactions, a lack of social support, and newly arising stressors associated with the COVID-19 crisis could potentially affect students' mental health negatively. In line with the other ongoing research studies conducted across the globe, the effects of the COVID-19 pandemic on a student population were examined [1, 27-30]. The sudden change to the education system has negative impact on universities, instructors, and students. Neither universities nor instructors and students were ready for a fully online education. Most of the universities did not have the infrastructure to deliver the courses fully online in this transition term (TT).

There are several Covid-pandemic related researches in the literature since it pandemic has affected people across the world socially, economically, physiologically and mentally. The study investigated on how the COVID-19 crisis affected the social networks, and how changes in students' social networks and daily lives affected the students' mental health (i.e., depressive symptoms, anxiety, loneliness, and stress) in Switzerland [1]. Another research explored the experience of students with performance-based, in-class and learner-centered, online assessment and the effects of these formats on comprehensive exam scores in an educational psychology [31]. Another study identified the high-impact practice principles of online higher education and provided a case study for colleagues at universities to consider conducting online education in similar circumstances [18]. In 2020, the authors give 12 tips on how to integrate MOOC videos as a part of regular classroom lectures to create a positive blended learning environment to improve the student learning experiences [32, 33].

This paper explores how the students' perceptions and preferences changed from transition term (TT) to during Covid pandemic (DC).

3 Research Objectives and Methodology

The objectives of this study are grouped in three categories, comparing the stage when the pandemic started and during the Covid-19 pandemic:

- How the students' preferences for online learning have changed from transition term (TT) to the on-going period of Covid-19 (DC) by gender and online courses taken.
- How technology usage Learning Management Systems and Online platforms impact students' learning.
- How students' preferences for traditional and online learning have changed by gender and grades.

In this study, a survey was administered online to collect the data. The survey was designed with a 5-point-Likert scale ranging from strongly disagree to strongly agree based on the following topics: preferences of online and in-class learning, technology usage, online platforms, and demographic information. The survey was conducted in Winter 2020 and Winter 2021 terms at two Canadian universities in Ontario. In Transition term (TT), that is March/April of 2020, 33 students participated in which 20 (60.6%) of the respondents were males and 13 (39.4%) of them were females. However, during the Covid-19 (DC) period of March/April 2021, 137 students participated, in which 66 (48.18%) were male and 71 (51.82%) were female. In TT period, 14 (42.4%) of the respondents passed with grade A (includes A+, A and A-), 9 (27.3%) with grade B (includes B+, B and B-), 7 (21.2%) with grade C (includes C+, C and C-), 1 (3.0%) with grade D (includes D+, D and D-) and 2 (6.1%) of them failed with grade F. On the other hand, in DC period, 37 (27.0%) of the respondents passed with grade A, 27 (19.7%) with grade B, 37 (27.0%) with grade C, 28 (20.4%) with grade D and 5 (3.6%) of them failed with grade F. While 10 (30.3%) of the responders were 1st year students, 10 (30.3%) were 2nd year, 12 (36.4%) were 3rd year and 1 (3.0%) were 4th year students in the TT period, 83 (60.58%) of the responders were 1st year students, 36 (26.28%) were 2nd year, 11 (8.0%) were 3rd year and 7 (5.11%) were 4th year students in the DC period. The participants were undergraduate business students in the TT period and both business and engineering students in DC period. Out of 33 respondents in the TT period, 5 (15.2%) took one online course in the past (or currently taking), 13 (39.4%) took 2 online courses, 6 (18.2%) took 3 online courses, 4 (12.1%) took 4 online courses, 1 (3.0%) took 5 online courses and 6 (18.2%) took more than 5 online courses. Similarly, out of 137 respondents in the DC period, 3 (2.1%) took one online course in the past (or currently taking), 6 (4.4%) took 2 online courses, 3 (2.1%) took 3 online courses, 18 (13.1%) took 4 online courses, 17 (12.4%) took 5 online courses and 90 (65.7%) took more than 5 online courses. In this study, the number of online courses taken by students

will be combined into three group for simplicity, that are less than (<5), 5 and more than 5 (>5).

4 Research Findings and Discussion

In this study, a survey was designed in three parts, perceptions of online and traditional education and technology with 23 items, online platforms with 6 items and demographic questions. The same survey was conducted in three periods, which were before Covid-19 (BC), TT, and DC. The results of TT and before Covid-19 (BC) were published in another study [5]. The survey was pre-tested, and some adjustments made on the questions. The Cronbach alpha reliability coefficient of the items in the survey was found to be 0.776 (p<0.005), which indicated that the instrument used was reliable. In addition to the survey, all assessment grades were collected with students' permission anonymously.

4.1 Perception of students on online and traditional learning

In this section, first the students' preferences for online and traditional learning are compared, second preferences of synchronous and asynchronous courses are discussed.

4.1.1 Comparison of preferences for online and traditional learning between TT and DC periods

In both surveys, which were conducted in TT period in March/April 2020, and DC period in March/April 2021, there were 11 items that measured the preference of students on online and traditional education. To investigate how the preferences of students have changed, survey results are compared according to gender and the number of online courses taken in the past.

For the first item, "I believed that online education increases my learning levels", while the preferences of males decreased from 45.0% to 25.8%, the preferences of females remained same from TT to DC. This shows that students mostly do not believe that the online education increases their learning levels (Table 1: A2). On the other hand, the agreement level of male students on the second item indicated that traditional education increases my learning level decreased very small amount from 75% to 71.2%, however, female agreement level increased from 61.6% to 73.2% from TT to DC (Table 2: A3). Although there are small changes on the preferences of both males and female students, both genders are mostly agreed that traditional education increases the learning level when compared with the online education from TT to DC.

Another item in the survey "I think students learn more with online courses", the agreement level of both genders is very low, but interestingly, while the agreement level of males has decreased from 30% to 22.7%, and for females it has increased from 15.4% to 19.7% from TT to DC. This indicates that female student's approaches to online education is more optimistic than the males even though agreement level is very low for both genders (Table 1: A4). Although both genders agreed on the item "I value face-to-face interactions with professors and peers in a classroom environment.", agreement level of males increased more than females from TT to DC (Table 1: A9). Females are more sensitive than males for face-to face interaction. Similar percentage changes were seen on the item "Interaction with other students in a classroom environment is easier than in an online environment" (Table 1: A16). This shows that interaction is very important for both genders.

The preferences for online education have changed negatively by genders as revealed in item "I think online courses are easier than traditional courses." This negative change is seen more for males than females. While the 50% of males believed the online courses are easier than traditional courses in TT, this decreased to 36.4% in DC, however it was increased from 23.1% to 29.6% for the females. The genders' preferences difference on the agreement shows that females are more adaptable to the online courses than the males (Table 1: A15).

There is a big difference of disagreement level for males from TT to DC in which the knowledge gained from an online course is equivalent to knowledge gained from a traditional course. It was increased from 25% to 51.5%. However, there is no big change of the disagreement and agreement levels for females, only 3.1% increase for the disagreement level and 4.0% decrease in agreement level from TT to DC (Table 1: A17).

There is a small gender difference on agreement and disagreement levels for the online classes being perceived harder and more challenging than the traditional classes from TT and DC. While disagreement level increased 11.7% and agreement level decreased 2.6% for males, the disagreement level increased 9.2% and the agreement level opposite to males increased 4.5% for females from TT to DC. According to the other research using the same survey before Covid-19 (BC) and Transition term (TT), the agreement levels increased for both genders 21.5% for males and 22.1% for males from BC to TT [5]. It is very interesting that less than half of the students agreed that the online classes are perceived harder and more challenging than the traditional classes after taking at least five online

courses in DC whereas it was approximately 24% in BC. Although there is approximately 25% increase from BC to TT [5], agreement level of males decreased 2.6% for males and it increased 4.5% for females (Table 1: A18).

Table 1 Preferences of online and traditional education by gender (%).

Gender		TT (%)			DC (%)		
		Male (n=20)	Female (n=13)	χ*	Male (n=66)	Female (n=71)	χ*
A2	SD+D	40.0	46.2	0.685	53.0	43.7	0.538
	N	15.0	23.1		21.2	26.8	
	SA+A	45.0	30.8		25.8	29.6	
A3	SD+D	0.0	15.4	0.193	6.1	5.6	0.966
	N	25.0	23.1		22.7	21.1	
	SA+A	75.0	61.5		71.2	73.2	
A4	SD+D	40.0	61.5	0.452	47.0	53.5	0.745
	N	30.0	23.1		30.3	26.8	
	SA+A	30.0	15.4		22.7	19.7	
A9	SD+D	20.0	15.4	0.937	12.1	12.7	0.713
	N	20.0	23.1		12.1	16.9	
	SA+A	60.0	61.5		75.8	70.4	
A15	SD+D	35.0	46.2	0.270	34.8	42.3	0.616
	N	15.0	30.8		28.8	28.2	
	SA+A	50.0	23.1		36.4	29.6	
A16	SD+D	20.0	15.4	0.741	18.2	11.3	0.432
	N	15.0	7.7		12.1	16.9	
	SA+A	65.0	76.9		69.7	71.8	
A17	SD+D	25.0	46.2	0.348	51.5	49.3	0.697
	N	20.0	23.1		18.2	23.9	
	SA+A	55.0	30.8		30.3	26.8	
A18	SD+D	15.0	7.7	0.811	27.3	16.9	0.328
	N	40.0	46.2		30.3	32.4	
	SA+A	45.0	46.2		42.4	50.7	
A19	SD+D	30.0	15.4	0.558	19.7	21.1	0.699
	N	25.0	38.5		34.8	28.2	
	SA+A	45.0	46.2		45.5	50.7	
A20	SD+D	10.0	7.7	0.583	4.5	4.2	0.616
	N	30.0	15.4		7.6	12.7	
	SA+A	60.0	76.9		87.9	83.1	
A23	SD+D	10.0	15.4	0.189	21.2	12.7	0.188
	N	20.0	46.2		30.3	23.9	
	SA+A	70.0	38.5		48.5	63.4	

* Asymptotic Significance (2-sided); TT: Transition term, DC: During the pandemic, SD: Strongly Disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly Agree

The agreement level of males for the item "students who take online courses will not learn the material as well due to the lack of personal interaction with the professor and the peers" remained the same, but it was 4.3% increased for females from TT to DC. However, gender disagreement level decreased 10.3% for males and 5.7% increased 5.7% for females (Table 3: A19).

The agreement level of both genders on "traditional courses supported with online elements" positively changed from TT to DC, 60.0% to 87.9% for males

and 76.9% to 83.1% for females (Table 3: A20). Both males and females prefer traditional courses with technology equipped classes.

There is a big difference between the preferences of males and females on the item "I prefer online courses because I have more flexibility in balancing my job and schoolwork." While 70% of males agreed in TT but 48.5% agreed in DC, 38.5% and 63.4% of females agreed in TT and DC, respectively. The males expected that it would be easy to handle both schoolwork and job, but during the pandemic, since the study time increased for the online courses and the number of jobs dramatically decreased, their expectations negatively changed. (Table 1: 23)

When the independency of gender and each item components in TT and DC was tested by using Chi-square test with the hypotheses:

Ho: Item components are independent of gender versus
H₁: Item components are dependent on gender

At 5% level of significance, it was found that all p values were greater than 0.05 for all items, hence item components measuring preferences of online and traditional learning were independent of gender (Table 1)

To investigate how the students' preferences for online and traditional learning have changed from TT to DC, the same items in Table 1 were compared to the number of online courses taken in the past. Since universities have continued the education virtually due to Covid-19, all traditional courses were switched to online courses in synchronous mode. Some students enrolled in a maximum of 5 courses per semester required by the universities understudied. With this reality in mind, the number of online courses were taken were divided into three groups, less than 5, 5 and greater than 5.

The agreement level on item "online education increases learning levels" of students who took less than 5 and greater than 5 courses decreased by 2.3%, and 7.7%, respectively; however it increased by 17.6% for the students who took 5 online courses from TT to DC. This opposite change is resulted from the number of students who took online course in TT, because there is only one student who took 5 courses in TT (Table 2: A2) For this reason, only less than and greater than 5 online courses taken are compared in the rest of the paper. For the item, "traditional education increases the learning level", students who took less than and more than 5 courses mostly agreed in TT and DC, 65.4% to 73.3% and 83.3% to 73.3% respectively. Although the agreement levels were

high, preferences of students who took more than 5 online courses decreased of 10% (Table 2: A3).

While the agreement levels on the item "students learn with online courses" remained same for the students who took less than 5 courses from TT to DC, there is a small increase, from 16.7% to 21.1%, seen for the students who took more than 5 online courses. However, approximately 50% of them disagreed in both TT and DC. (Table 2: A4).

Table 2 Preferences of online and traditional education by online courses taken (%).

Number of online courses taken		TT (%)				DC (%)			
		<5 (n=26)	5 (n=1)	>5 (n=6)	χ*	<5 (n=30)	5 (n=17)	>5 (n=90)	χ*
A2	SD+D	38.5	100.0	50.0		40.0	41.2	52.2	
	N	19.2	0.0	16.7	0.796	20.0	41.2	22.2	0.223
	SA+A	42.3	0.0	33.3		40.0	17.6	25.6	
A3	SD+D	7.7	0.0	0.0		13.3	0.0	4.4	
	N	26.9	0.0	16.7	0.851	13.3	35.3	22.2	0.151
	SA+A	65.4	100.0	83.3		73.3	64.7	73.3	
A4	SD+D	46.2	100.0	50.0		40.0	58.8	52.2	
	N	26.9	0.0	33.3	0.845	33.3	29.4	26.7	0.656
	SA+A	26.9	0.0	16.7		26.7	11.8	21.1	
A9	SD+D	19.2	0.0	16.7		10.0	17.6	12.2	
	N	19.2	0.0	33.3	0.869	6.7	23.5	15.6	0.446
	SA+A	61.5	100.0	50.0		83.3	58.8	72.2	
A15	SD+D	42.3	0.0	33.3		43.3	35.3	37.8	
	N	23.1	100.0	0.0	0.170	23.3	41.2	27.8	0.733
	SA+A	34.6	0.0	66.7		33.3	23.5	34.4	
A16	SD+D	23.1	0.0	0.0		26.7	11.8	11.1	
	N	15.4	0.0	0.0	0.425	6.7	17.6	16.7	0.231
	SA+A	61.5	100.0	100.0		66.7	70.6	72.2	
A17	SD+D	26.9	100.0	50.0		43.3	47.1	53.3	
	N	26.9	0.0	0.0	0.340	26.7	29.4	17.8	0.712
	SA+A	46.2	0.0	50.0		30.0	23.5	28.9	
A18	SD+D	15.4	0.0	0.0		20.0	17.6	23.3	
	N	42.3	100.0	33.3	0.544	16.7	47.1	33.3	0.181
	SA+A	42.3	0.0	66.7		63.3	35.3	43.5	
A19	SD+D	30.8	0.0	0.0		13.3	11.8	24.4	
	N	34.6	0.0	16.7	0.184	23.3	47.1	31.1	0.208
	SA+A	34.6	100.0	83.3		63.3	41.2	44.4	
A20	SD+D	11.5	0.0	0.0		6.7	5.9	3.3	
	N	30.8	0.0	0.0	0.349	0.0	11.8	13.3	0.296
	SA+A	57.7	100.0	100.0		93.3	82.4	83.3	
A23	SD+D	11.5	100.0	0.0		26.7	5.9	15.6	
	N	38.5	0.0	0.0	0.014	20.0	29.4	28.9	0.406
	SA+A	50.0	0.0	100.0		53.3	64.7	55.6	

* Asymptotic Significance (2-sided); TT: Transition term, DC: During the pandemic.
SD: Strongly Disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly Agree

For the face-to-face interactions with professors and peers in classroom environment, agreement level of students who took less than 5 and more than 5 courses both increased approximately 21% from TT to DC. This shows that they all value the face-to-face interactions (Table 2: A9). Although the students who took less than and more than 5 courses agreed for the item "interaction with other students in classroom is easier than in online environment", while the agreement of students increased 5.2% for the students who took less than 5 courses, it

decreased 27.8% for the students who took more than 5 courses (Table 2: A16).

The agreement and disagreement levels of students who took less than 5 courses remained approximately the same from TT to DC on the item "I think online courses are easier than traditional courses.", however the agreement level of the students taking more than 5 courses decreased from 66.7% to 34.4% and disagreement level increased from 33.3% to 37.8%. Preferences of students have changed negatively after taking more online courses because study time increased, the mental problems occurred, and they could not easily focus on the online courses (Table 2: A15)

The agreement level of students both taking less than and more than 5 courses for which the knowledge gained from an online course is equivalent to knowledge gained from a traditional course decreased from TT to DC, 16.2% decrease for the students who took less than 5 courses and 21.1% decrease for the students who took more than 5 courses. This is because in TT, students started the courses in-class then they were forced to continue online due to Covid-19, but in DC, they had to stay home with online learning and socialization changed their preferences negatively (Table 2: A17) For the item "online classes are harder and more challenging than traditional classes" there is a difference on the preferences of students who took less than and more than 5 courses from TT to DC. It increased from 42.3% to 63.3% for the students who took less than 5 courses whereas it decreased from 66.7% to 43.5% for the students who took more than 5 courses (Table 2: 18) Similar results are seen for the item "students who take online courses will not learn the material as well due to the lack of personal interaction with the professor and the peers". This shows that students who took more than 5 courses had more experience and they learnt how to communicate with the other students easily. During the live class, they are asking each other on zoom chat if they have a social media group such as Whatsapps group, Facebook, Twitter or Google. (Table 2: A19)

Although both group of students who took less than and more than 5 courses mostly agreed on the traditional courses with technology equipped classes in TT and DC, while the agreement level increased from 57.7% to 93.3% for the students who took less than 5 courses, it was decreased from 100% to 83.3% for the students who took more than 5 courses (Table 2: A20).

Similar to the differences of the genders' preferences, there is a big difference between the preferences of students taking less than and more than 5 online courses on the item "I prefer online courses because

I have more flexibility in balancing my job and schoolwork" from TT to DC. Although there is a small increase (3.3% from 50% to 53.3%) on the agreement of students who took less than 5 online courses, the agreement level of the students who took more than 5 online courses decreased from 100% to 55.6% from TT to DC. This is because during the pandemic, many people lost their jobs and with limited number of jobs opening, they could not find a job which resulted them spending more time on learning the online course materials (Table 1: 23).

When the independency of the number of online courses taken and each item components in TT and DC were tested separately by using Chi-square test with the following hypotheses:

Ho: Item components are independent of the number of online courses taken.
versus
H_1: Item components are dependent on the number of online courses taken.

At 5% level of significance, it was found that all p values were greater than 0.05, hence the item components were independent of the number of online courses taken (Table 2).

4.1.2 Preferences of Synchronous and asynchronous courses

In many universities, students have an opportunity to take some courses that are offered either in-class or online. The online courses could be delivered in two ways, either synchronously or asynchronously. For synchronous courses, students and instructors meet in real time with a set schedule whereas for asynchronous courses, students learn on their own paces and there is no set schedule except for due date of assignments or tests. In both synchronous and asynchronous course deliveries, course materials are posted on the university's Learning Management System (LMS), like Moodle, Brightspace, etc. Students are expected to learn materials by themselves for asynchronous courses, however for synchronous courses, they will have scheduled live lectures by using online learning platforms, such as Zoom, Google, Microsoft Teams, etc. In this section, the perception of students on synchronous and asynchronous courses will be discussed only in DC because in TT term all students started the courses in-class and it was mandatory for them to finish the same courses synchronously online. They did not have any asynchronous course experience.

When compared students' gender with their agreement on learning less with asynchronous online courses, both males and females are mostly neither agree nor disagree, only 33.3% of males and females agreed (Fig 1a). This shows that students did not attend the live lectures and they could not make the distinction between the learning levels between synchronous and asynchronous courses. There is a big difference among the agreement levels on learning less with asynchronous online courses when compared with their class standing. The 2nd year students have the highest level of agreement (47.2%), then the 1st year (31.3%), 3rd year (18.2%) and with the smallest agreement level, 4th year students (14.2%) followed, respectively. This is because the 4th year students have more experiences on asynchronous courses.
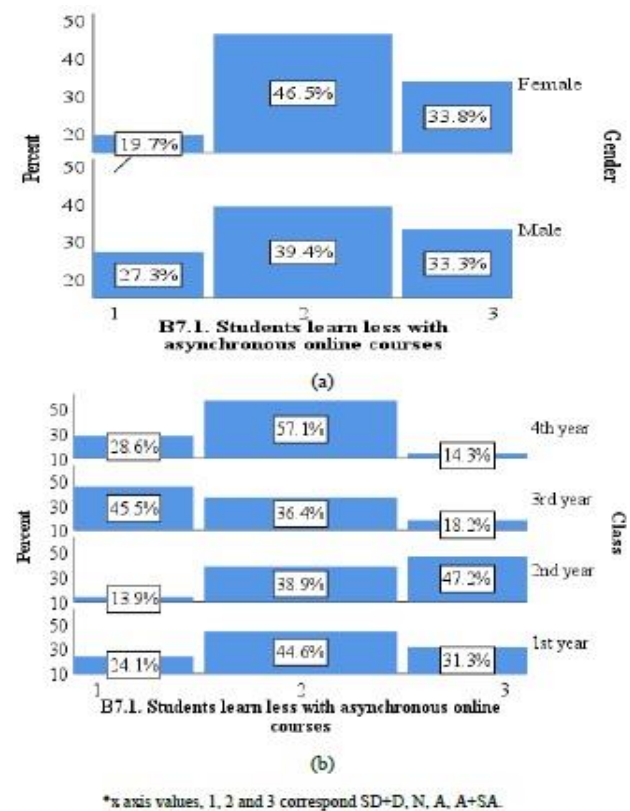

Fig. 1 Preferences of learning levels of asynchronous courses by a) gender, b) class standing.

Although only 33.3% of both males and females agreed that less learning with asynchronous courses, 47.89% of females and 42.42% of males agreed on performing better in synchronous online courses than asynchronous online courses (Fig 2a). The agreement levels of students according to their class standing are distributed in the range 42.9% to 47.2% even though their disagreement levels are different. While none of the 3rd year students disagreed on the less learning with asynchronous courses, however, 42.9% of 4th years students disagreed, then with 22.9% and 13.9% of disagreement levels 1st and 2nd year students followed respectively (Fig 2b).
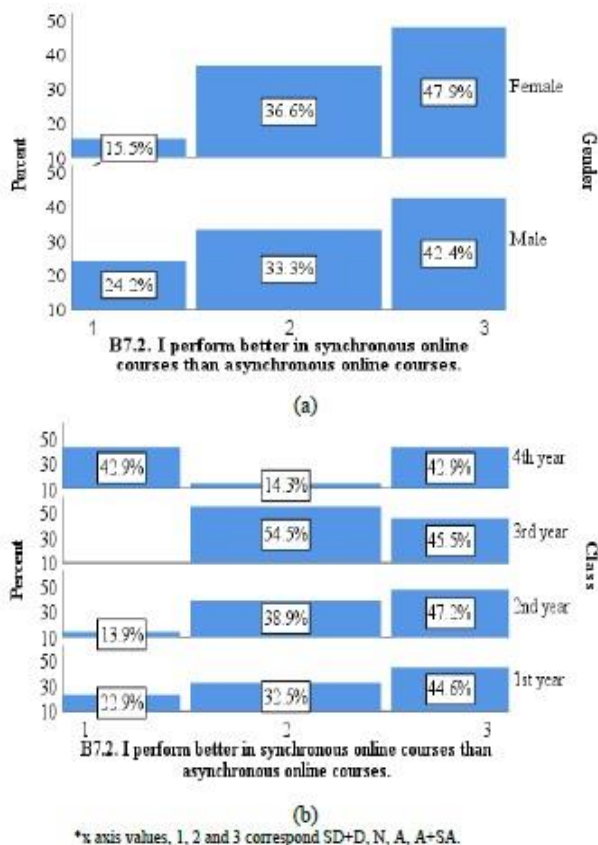
Fig. 2 Preferences of performing in synchronous and asynchronous courses by a) gender, b) class standing.
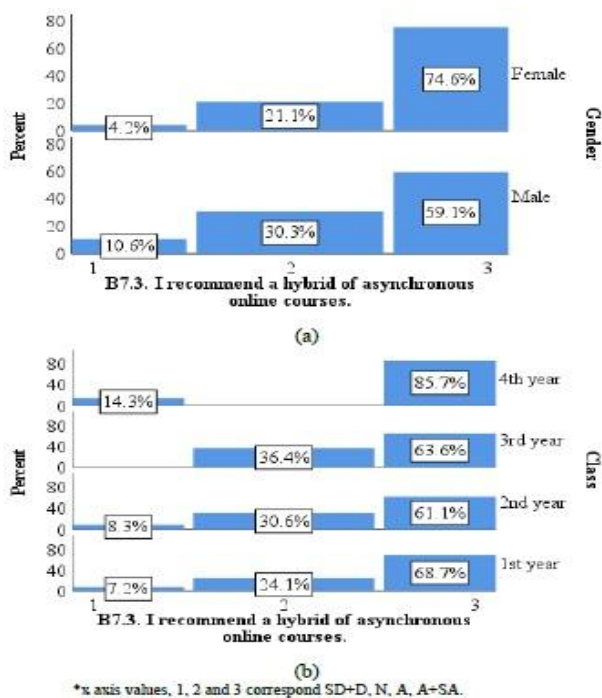

Fig. 3 Recommending a hybrid of asynchronous courses by a) gender, b) class standing.

There is a difference between the agreement level of males and females for recommending a hybrid of

asynchronous online courses, even though they are mostly agreed. 59.1% of males and 74. 7% of females agreed to recommend a hybrid of asynchronous courses (Fig 3a). Similar agreement levels can be seen for the class standing. This shows, they prefer to meet to instructor in live lectures, and they do not want to spend more time on studying to understand the materials by themselves (Fig 3b)
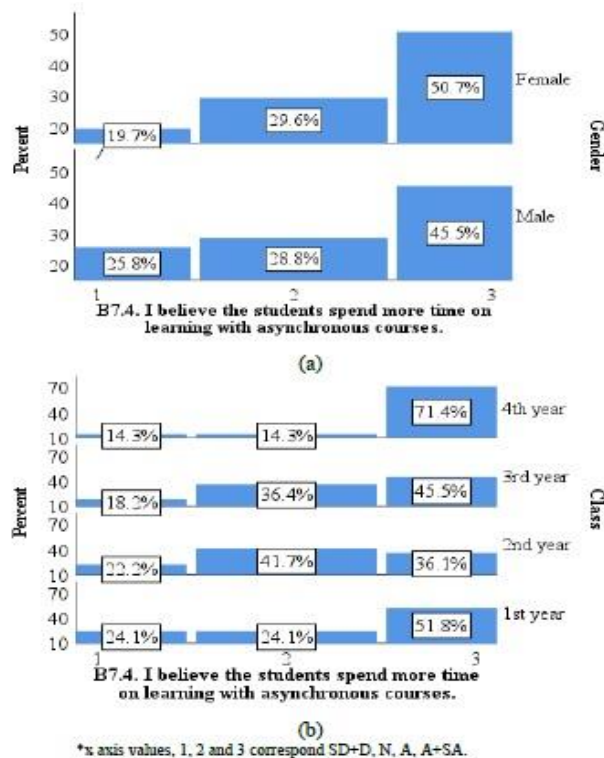

Fig. 4 Spending more time on learning with asynchronous courses by a) gender, b) class standing.

For spending more time on learning with asynchronous courses, preferences of males and females are similar. The agreement levels are 45.5% for males and 50.7% for males (Fig 4a). However, preferences of students by class standing are different. Since 4th year students had more experience on synchronous and asynchronous courses, their agreement level is the highest (71.4%). While the 1st year (51.6%) and the 3rd year students (45.5%) have moderately agreement, only 36.1% of the 2nd year students agreed on the same item (Fig 4b).

There is a small difference of the agreement level of males and females on students feel less stress learning with asynchronous course, 45.5% of males and 50.7% of females (Fig 5a). On the same item, while the 4th and 3rd years students have high agreement level (85.7% and 81.8%, respectively), only 63.3% of the 1st year and 50% of 2nd year students agreed (Fig 5b)
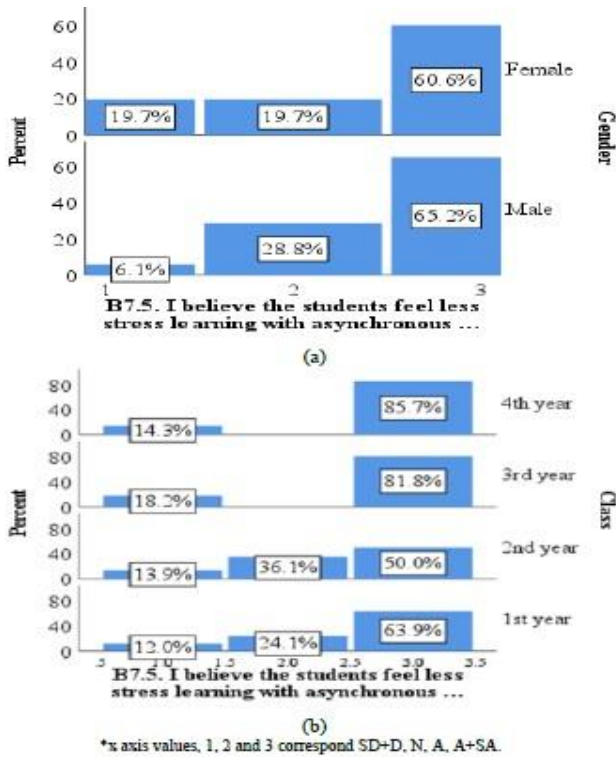
Fig. 5 Feeling less stress learning with asynchronous course, because they can study the materials any time on their own pace a) gender, b) class standing.
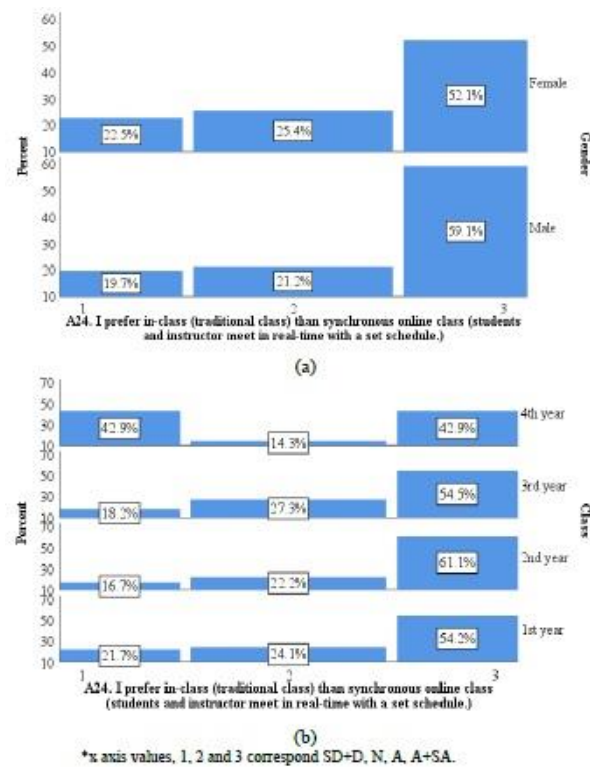

Fig. 6 Preferring in-class courses to synchronous online courses by a) gender, b) class standing.

When the preference of students compared on preferring in-class courses to synchronous online courses by gender and class standing, they were all moderately agreed, except the 4th year students, (42.9%) (Fig 6ab). The 4th year students also showed the highest disagreement level (42.2%) when compared the others. They have the same level of agreement and disagreement.

The students mostly support traditional courses. On the other hand, when it was asked their preferences on synchronous and asynchronous courses, they preferred synchronous courses. As it was discussed above, interaction is very important to them. Students like face-to-face interaction, they do not want to learn the materials by themselves.

4.2 Technology used in online learning

In this technology age, students are growing with technology, and they are very heavy users of technology products. With the start of pandemic in early March 2020, all in-class courses were converted to online courses, students, instructors and institutions faced many challenges to the sudden change of teaching platform. Universities use different software applications for administration, course deliveries, reporting, automation, etc. These software applications are called Learning management systems (LMS) [34]. While using different learning management systems, Brightspace, Blackboard, eClass, Moodle and soon, universities started to use the same LMS to deliver online courses. Instructors posted course materials on LMS asynchronously, but they have to meet with the students with live lectures and office hours. The most popular tools such as Zoom calls, Google meeting, and Microsoft Team are commonly used in a sychronous course. Instructors also use different online platforms to host the assignments and tests. In this section, three topics will be discussed: LMS and online learning platforms in learning, video conferencing is an effective tool for a live lecture in learning and general perception of students for technology used in learning.

4.2.1 Effectiveness of Learning management systems and online platforms in learning.

One of the uses of LMS is delivering the online courses. All course materials, such as lecture slides, announcements, course outlines are posted on LMS. It is used for communication and assessments as well. Majority of students agreed that LMS and online platforms are helping them to learn the challenging subject matter easier in both TT and DC, however, while the agreement level of males decreased 7.3%, the agreement level of females increased by 18.8%

from TT to DC. This shows the female students integrated the system easier than males (Table 3: A1).

Table 3 LMS and Online platform preferences by gender (%).

Gender		TT (%)			DC (%)		
		Male (n=20)	Female (n=13)	χ*	Male (n=66)	Female (n=71)	χ*
A1	SD+D	0.0	15.4	0.175	16.7	9.9	0.477
	N	20.0	23.1		10.6	9.9	
	SA+A	80.0	61.5		72.7	80.3	
A10	SD+D	10.0	7.7	0.759	9.1	7.0	0.452
	N	25.0	15.4		7.6	14.1	
	SA+A	65.0	76.9		83.3	78.9	
A11	SD+D	20.0	15.4	0.877	24.2	36.6	0.286
	N	45.0	53.8		31.8	25.4	
	SA+A	35.0	30.8		43.9	38.0	
B1.1	SD+D	15.0	7.7	0.524	0.0	1.4	0.449
	N	5.0	15.4		7.6	4.2	
	SA+A	80.0	76.9		92.4	94.4	
B1.2	SD+D	5.0	7.7	0.872	13.6	5.6	0.255
	N	25.0	30.8		10.6	14.1	
	SA+A	70.0	61.5		75.8	80.3	
B1.3	SD+D	15.0	38.5	0.303	6.1	4.2	0.215
	N	35.0	23.1		19.7	9.9	
	SA+A	50.0	38.5		74.2	85.9	

* Asymptotic Significance (2-sided); SD: Strongly Disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly Agree

On the other hand, agreement levels of males and females increased for which LMS, and online platforms improve the learning process, from 65% to 83.3% for males and from 76.9% to 78.9% for females in TT and DC, respectively (Table 3: A10). The results show that students generally do not like to communicate by discussion board in the LMS. There is a small agreement change from TT to DC, 35% to 43.9% for males and 30.8% to 43.9% for females. When they do their group projects for the online course, they need to discuss them via discussion board. This is sometimes difficult for them if the other members did not participate in the meeting. They generally prefer to contact each other by social media, such as WhatsApp, Facebook, etc., instead of using the discussion board (Table 3: A11). It is seen from Table 3, B1.1, B1.2 and B1.3, both males and females are highly agreed that LMS and online learning platform are easy to use, reliable and effective learning tool, respectively. Their agreement levels increased from TT to DC, parallelly (Table 3: B1.1-B1.3).
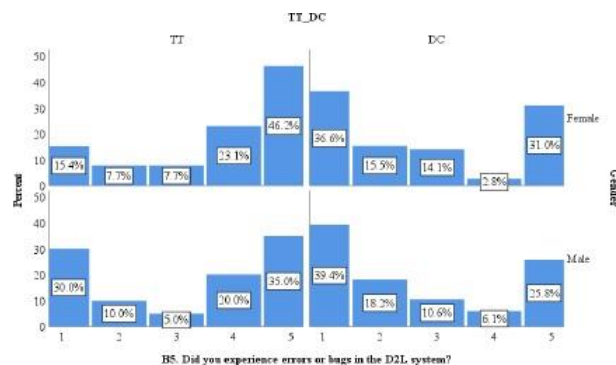

Fig. 7 Student perceptions about LMS by gender (%)

Table 4 Student perceptions about LMS by gender and total (%).

Gender	TT (%)				DC (%)			
	Male (n=20)	Female (n=13)	Total (n=33)	χ*	Male (n=66)	Female (n=71)	Total (n=137)	χ*
1. Minor inconvenience	30.0	15.4	24.2		39.4	36.6	38	
2. Slowed my ability to complete homework	10.0	7.7	9.1		18.2	15.5	16.8	
3. No influence on my homework	5.0	7.7	6.1	0.891	10.6	14.1	12.4	0.791
4. I was unable to complete my homework in a timely manner	20.0	23.1	21.2		6.1	2.8	4.4	
5. No problems at all	35.0	46.2	39.4		25.8	31	28.5	

* Asymptotic Significance (2-sided)

The perception of students on whether they experience errors or bugs in LMS are different from TT to DC. While 24.2% of them in TT said that it caused minor inconvenience, whereas 38% of them indicated that in DC. Likewise, their experiences on the LMS slowed their ability to complete homework were increased from 9.1% to 16.8% form TT to DC. Likewise, 6.1% of them had no influence on their homework in TT, 12.4% in DC. Experiences on being unable to complete their homework in a timely manner decreased from 21.2% to 4.4% from TT to DC. Similarly, they mentioned that they did not have problems as 39.4% in TT whereas 28.5% in DC. This is because they took the courses half in class and half online in TT, but they took all courses online in DC. When the experiences of males and females were compared, both had the similar experiences on LMS (Table 4, Fig. 7).

When the independency of gender and each item components in TT and DC were tested by using Chi-square test with the following hypotheses:

Ho: Item components are independent of gender versus
H₁: Item components are dependent on gender
At 5% level of significance, it was found that the p values for all items were greater than 0.05, hence item components were independent of gender (Table 3, Table 4)

To see if there is a difference on LMS and online platform preferences by the number of online courses taken, the agreement level of students will be compared according to the number of online courses taken less than 5, 5 and more than 5.

Although the great majority of students taken less than 5 and more than 5 online courses agreed on LMS and the online learning platform were helping them to learn the challenging subject matter easier in both TT and DC, while the agreement level of students taken less than 5 online courses remained the same (73.3%), it was decreased from 83.3% to 76.7% for the students taken more than 5 online courses (Table 5: A1). For the item "LMS and online platforms improve the learning process" while the agreement level of students taken less than 5 online courses increased 65.4% to 83.3% from TT to DC, it decreased from 83.3% to 78.9% for the students taken more than 5 online courses (Table 5: A10).

Table 5 LMS and Online platform preferences by the number of online courses taken (%).

Number of online courses taken		TT (%)				DC (%)			
		<5 (n=26)	5 (n=1)	>5 (n=6)	χ*	<5 (n=30)	5 (n=17)	>5 (n=90)	χ*
A1	SD+D	7.7	0.0	0.0		20.0	17.6	10.0	
	N	19.2	100.0	16.7	0.356	6.7	0.0	13.3	0.278
	SA+A	73.1	0.0	83.3		73.3	82.4	76.7	
A10	SD+D	11.5	0.0	0.0		6.7	5.9	8.9	
	N	23.1	0.0	16.7	0.830	10.0	5.9	12.2	0.912
	SA+A	65.4	100.0	83.3		83.3	88.2	78.9	
A11	SD+D	23.1	0.0	0.0		16.7	47.1	32.2	
	N	50.0	100.0	33.3	0.276	13.3	23.5	34.4	0.004
	SA+A	26.9	0.0	66.7		70.0	29.4	33.3	
B1.1	SD+D	15.4	0.0	0.0		0.0	0.0	1.1	
	N	11.5	0.0	0.0	0.664	6.7	5.9	5.6	0.966
	SA+A	73.1	100.0	100.0		93.3	94.1	93.3	
B1.2	SD+D	7.7	0.0	0.0		13.3	0.0	10.0	
	N	30.8	100.0	0.0	0.199	0.0	17.6	15.6	0.116
	SA+A	61.5	0.0	100.0		86.7	82.4	74.4	
B1.3	SD+D	26.9	100.0	0.0		0.0	5.9	6.7	
	N	30.8	0.0	33.3	0.255	13.3	11.8	15.6	0.664
	SA+A	42.3	0.0	66.7		86.7	82.4	77.8	

* Asymptotic Significance (2-sided); SD: Strongly Disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly Agree

Since LMS and online learning platforms are their main tools to access course materials and communicate, the great majority of students agreed on the LMS, and online platforms improve their learning and help them to learn the challenging subject matters. Taking half of the courses online in TT and all courses in DC is another factor to see the difference on their agreements. There is a huge difference between the students taken less than and more than 5 online courses for communication via discussion board from TT to DC. While 26.9% of students taken less than 5 online courses agreed on how they liked to participate the class discussion board in TT, that agreement level increased to 70.0% in DC, but the agreement level of the students taken more than 5 online courses decreased from 66.7% to 33.3% in TT and DC, respectively (Table 5: A11). After taking more than 5 online courses, students used social media for communication, which they found it easier than the discussion board.

The agreement level of students who have taken less than 5 online courses increased on easiness, reliability, and effectiveness of LMS and online learning platform from TT to DC. On the other hand, for the students who have taken more than 5 online courses, their agreement level decreased from 100% to 93.3% and 74.4% on easiness and reliability of LMS and online learning platform, respectively, and it increased for effectiveness from 66.7% to 77.8%. (Table 5: B1.1-B1.3).

When the independency of the number of online courses taken and each item components in TT and DC was tested by using Chi-square test with the following hypotheses:

Ho: Item components are independent of the number of online courses taken
versus
H_1: Item components are dependent on the number of online courses taken.

At 5% level of significance, it was found that the p values for all items were greater than 0.05, hence item components were independent of the number of online courses taken (Table 5)

4.2.2 Is video teleconferencing an effective tool for a live lecture in learning?

During the Covid-19 pandemic, most of the universities started to use video teleconferensing to deliver the online classes remotely and online socialization with the students. Most commonly used video teleconferencing software is Zoom, Google, Microsoft Meeting, and skype. In this section, the perception of students on effectiveness of video teleconferensing (VTC).

Majority of students disagreed that learning in VTC is much better than learning in classroom environment in TT and DC. The agreement level of males and females decreased from 25% to 16.7%, and 23.1% to 22.5%, respectively (Table 6: A12). This shows that, the students most likely prefer in-class learning. During the VTC lecture, students cannot ask questions promptly as in-class lectures due to large class sizes. Living in different time zone due to pandemic, they could not attend the VTC lectures and they watch the recorded lecture if they are posted on LMS.

Table 6 Perception of students on VTC by gender (%).

Gender		TT (%)			DC (%)		
		Male (n=20)	Female (n=13)	χ^*	Male (n=66)	Female (n=71)	χ^*
A12	SD+D	55.0	53.8		66.7	59.2	
	N	20.0	23.1	0.976	16.7	18.3	0.619
	SA+A	25.0	23.1		16.7	22.5	
A13	SD+D	25.0	38.5		22.7	29.6	
	N	20.0	0.0	0.209	21.2	15.5	0.540
	SA+A	55.0	61.5		56.1	54.9	
A14	SD+D	25.0	7.7		15.2	12.7	
	N	20.0	30.8	0.420	24.2	15.5	0.345
	SA+A	55.0	61.5		60.6	71.8	
A22	SD+D	10.0	0.0		13.6	7.0	
	N	35.0	30.8	0.448	36.4	29.6	0.222
	SA+A	55.0	69.2		50.0	63.4	

* Asymptotic Significance (2-sided); SD: Strongly Disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly Agree

The students moderately agreed on benefitting from attending VTC session even when the notes are available online. The agreement level of males increased from 55.0% and 56.2%, but the agreement level of females decreased from 61.5% to 54.9% (Table 6: A13). This shows that when there is no chance to have in-class learning, VTC seems to be the best solution for learning.

The agreement level of both males and females preferring audio recorded lectures which are posted on LMS in advance so that they can prepare for the discussion in coming VTC lecture. The agreement level for both increased from TT to DC, especially for females, from 61.5% to 71.8%. This shows that there is a difference between the study habits of males and females.

Table 7 Perception of students on VTC by number of online courses taken (%).

Number of online courses taken		TT (%)				DC (%)			
		<5 (n=26)	5 (n=1)	>5 (n=6)	χ^*	<5 (n=30)	5 (n=17)	>5 (n=90)	χ^*
A12	SD+D	57.7	100.0	33.3		60.0	58.8	64.4	
	N	19.2	0.0	33.3	0.725	16.7	35.3	14.4	0.229
	SA+A	23.1	0.0	33.3		23.3	5.9	21.1	
A13	SD+D	26.9	100.0	33.3		16.7	35.3	27.8	
	N	15.4	0.0	0.0	0.484	23.3	11.8	17.8	0.621
	SA+A	57.7	0.0	66.7		60.0	52.9	54.4	
A14	SD+D	19.2	0.0	16.7		16.7	5.9	14.4	
	N	19.2	100.0	33.3	0.440	23.3	23.5	17.8	0.786
	SA+A	61.5	0.0	50.0		60.0	70.6	67.8	
A22	SD+D	7.7	0.0	0.0		20.0	23.5	4.4	
	N	30.8	100.0	33.3	0.632	26.7	29.4	35.6	0.054
	SA+A	61.5	0.0	66.7		53.3	47.1	60.0	

* Asymptotic Significance (2-sided); SD: Strongly Disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly Agree

When the same items compared with the number of courses taken, there is no big difference in the preferences. Most of the students disagreed that the learning in VTC is much better than learning in classroom environment in both TT and DC. While the agreement level approximately remained the same for the students who have taken less than 5 online courses, it reduced by 12.2% for the students who have taken more than 5 courses (Table 7: A12) Although the students moderately agreed on benefiting from attending VTC session even when the lecture notes are available online, preferences of students who took less than 5 and more than 5 courses inversely changed. While the agreement level increased by 2.3% for the students who took less than 5 courses, it decreased 12.3% (Table 7: A13). After taking many courses online, students cannot find time to attend live lectures, they prefer to listen or watch the recorded lecture at their own time. This may reduce their stress level. In addition, in order to get ready for the discussion in the upcoming VTC, attend they would like to access the lecture materials on LMS in advance. This is clearly seen from the preferences indicated to the statement of which I prefer the audio recorded lectures which are posted to LMS in advance so that I can prepare for the discussion in coming VTC meeting. The agreement level of students who took more than 5 online courses increased from 50.0% to 67.8% even though the agreement level of students who took less than 5 online courses decreased from 61.5% to 60.0%. Online learning has changed students study habits (Table 7: A14).

The students moderately agreed on the instructor to be more engaged in writing than presenting the lecture slides during the VTC meeting in TT and DC, however the agreement levels decreased by 8.2% and 6.7% for the students who took less than 5 and more than 5 online courses, respectively. They prefer having the instructors that use slides and give more examples other than on the slides. (Table 7: A22)

When the independency of the number of online courses taken and each item components in TT and DC was tested by using Chi-square test with the following hypotheses:

Ho: Item components are independent of the number of online courses taken
versus
H_1: Item components are dependent on the number of online courses taken.

At 5% level of significance, it was found that the p values for all items were greater than 0.05, hence item components were independent of the number of online courses taken (Table 7)

4.2.3 Technology used in class

Rapid growing technology changed our life. It has became part of our life. Inovations of computers, internet, cell phones etc., have changed education, such as smart classrooms, internet access in classroom, doing assignments online with online learning platforms, smart boards, use of LMS in learning, etc. With the growing technology, students expect to use technological devices in the classrooms. Ɨin this section, the perception of students will be discussed.

Table 8 Perceptions on technology use in learning by gender (%)

Gender		TT (%)			DC (%)		
		Male (n=20)	Female (n=13)	χ*	Male (n=66)	Female (n=71)	χ*
A5	SD+D	15.0	15.4		3.0	7.0	
	N	5.0	15.4	0.590	19.7	22.5	0.490
	SA+A	80.0	69.2		77.3	70.4	
A6	SD+D	0.0	7.7		1.5	1.4	
	N	5.0	0.0	0.334	1.5	2.8	0.873
	SA+A	95.0	92.3		97.0	95.8	
A7	SD+D	5.0	7.7		1.5	8.5	
	N	30.0	30.8	0.946	24.2	22.5	0.183
	SA+A	65.0	61.5		74.2	69.0	
A20	SD+D	10.0	7.7		4.5	4.2	
	N	30.0	15.4	0.583	7.6	12.7	0.616
	SA+A	60.0	76.9		87.9	83.1	
A21	SD+D	5.0	7.7		6.1	9.9	
	N	25.0	23.1	0.948	10.6	1.4	0.058
	SA+A	70.0	69.2		83.3	88.7	

* Asymptotic Significance (2-sided); SD: Strongly Disagree, D: Disagree, N: Neutral, A: Agree, SA: Strongly Agree

Majority of students agreed that classrooms with internet access enrich their learning in both TT and DC. Although the agreement level is very high, there is a small difference between the preferences of males and females from TT to DC. The level of agreement of males decreased by 2.7% whereas there was a small increase (1.2%) for the females in DC (Table 8: A5). Over 92.0% of males and females would like to see the course materials (assignments, PowerPoint presentations, etc.) posted on the course site for both traditional and online education in TT and DC (Table 8: A6). Again, most of the male and female students agreed that the use of technology in classroom increased their engagement and interests in the subject matter. The agreement level of both males and females increased in DC. It increased from 65.0% to 74.2% and from 61.5% to 69.0% for males and females respectively (Table 8: A7). Both males and females prefer traditional courses with online elements in both TT and DC. There is a small agreement level difference between the males and females. The agreement level of males increased

faster than females, from 60.0% to 87.9% for males, and 76.9% to 83.1% for females (Table 8: A20). Again, both males and females highly agreed that pre-posted audio or video recorded lecture slides help them to understand the topics, but this time agreement level of females increased faster than that of the males. This positive increase is from 70.0% to 83.3% for males and from 69.2% to 88.7% for females (Table 8: A21). It is not a surprise that overall, males and females like technology integrated education. This can be seen from Table 8. This agreement increased in DC when they have all their courses online.

4.3 Traditional and online learning by gender and grades

In this section, preference of students for online and tradtional classes and their learning levels will be discussed by gender and grades. The main purpose here to see if there is any difference among the grades and gender when the students strongly agreed plus agreed (SA+A) or disagreed plus strongly disagreed (D+SD) for traditional and online learning.
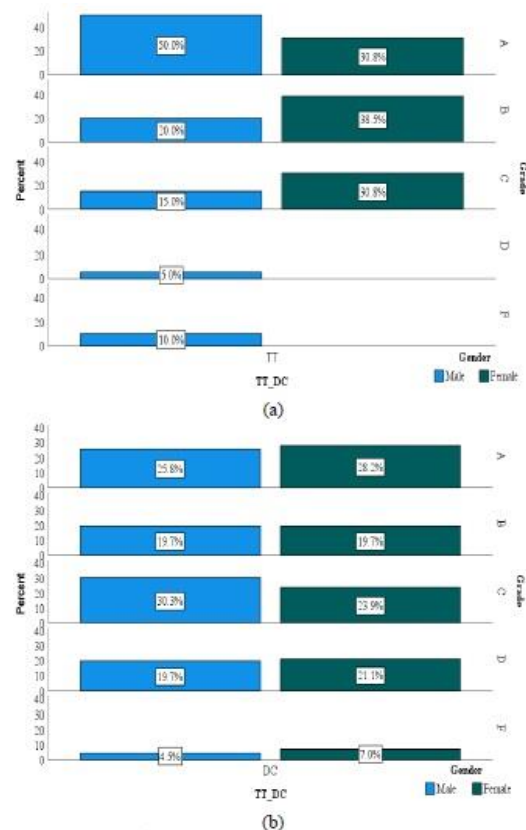

(a)

(b)

Fig. 8 TT and DC distributions by gender and grades
Fig 8 shows the grades of students by gender in TT and DC. When the gender difference compared with the grades in TT and DC, the grades in TT is much higher than the grades in DC. Grade A percentage

decreased from 50.0 % to 25.8% for males, while it decreased from 30.8% to 28.2% for females from TT to DC. Approximately 20% of males got B in TT and DC, however, percentage of females who got B decreased from 38.5% to 19.7%. While only 15.0% of males got C in TT, it increased to 30.3% in DC. Opposite to males, 30.8% of females who got C in TT and it reduced to 23.9% in DC. While the 5% and 10% of males who got D and F respectively in TT and there was no female who got D or F in TT. When the grades were compared by genders in TT and DC, it is seen that there is a big difference in genders according to the grades in TT, however the grades of males and females are similar in DC. All females passed at least with a C in TT, but 28.1% of them passed with a D and failed the course. Taking all courses online changed the grade distribution negatively for both males and females (Fig 8).

A15. I think online courses are easier than traditional courses ■Male ■Female

(a)

A15. I think online courses are easier than traditional courses ■Male ■Female

(b)
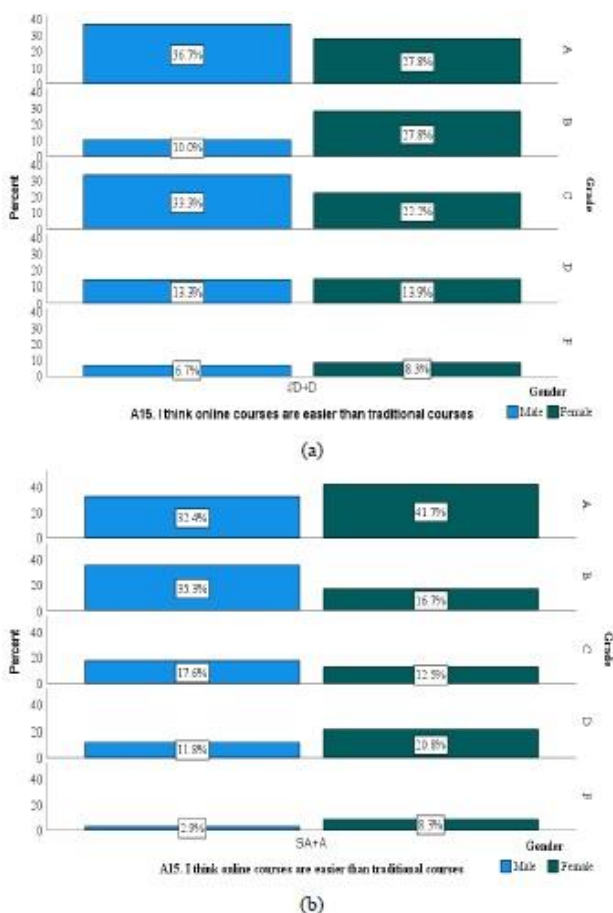
Fig. 9 The distribution of easiness of online courses than traditional courses by gender and grades

The grade differences of genders is seen on the grades A, B and C, when the students SD+D that the online courses are easier than the traditional courses. While 70% of males passed with grade A and C, only 50% of females passed the same grades. 10% of males passed with grade B whereas 27.8% of females

passed with grade B. On the hand, the grade difference according to gender is seen on the grades A, B and D when the students A+SA on the easiness of online courses compared with the traditional courses. While 41.7% and 20.8% of females passed with grades A and D respectively, these percentages are 32.4% and 11.8% for males respectively. But the percentages reversed for males and females for grade B, 35.3% of males versus 16.7% of females passed with grade B. The failing percentage of them is also different, failing percent of of females is almost 3 times of the failing percent of males (Fig. 9).

A18. I feel that online classes are harder and more challenging than the traditional classes. ■Male ■Female

(a)

A18. I feel that online classes are harder and more challenging than the traditional classes. ■Male ■Female
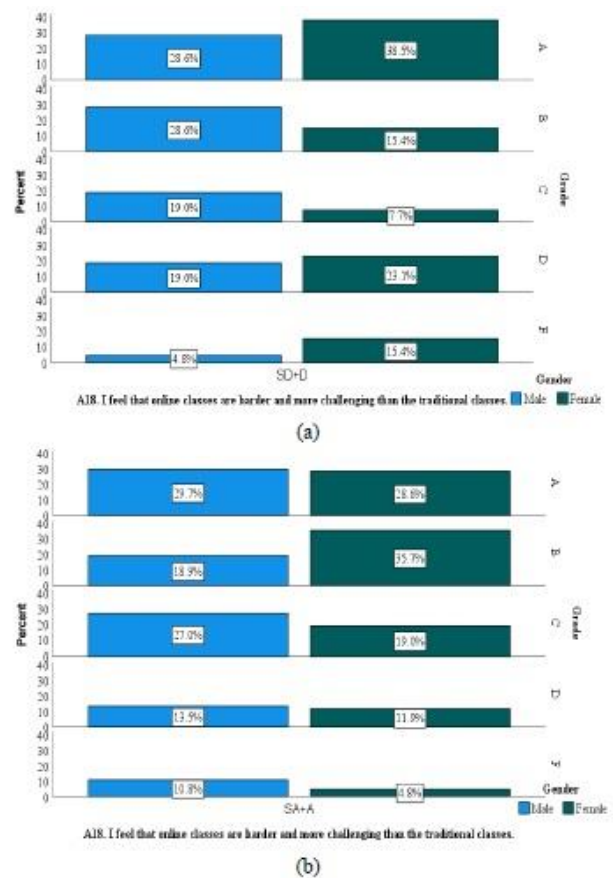
(b)

Fig. 10 Hardness and challenging distribution of online and traditional classes by gender and grades

Opposite to the item that online courses are easier than traditional courses, the distribution of grades by gender on the item that the online classess are harder and more challenging than the traditional classess is shown in Fig. 10. This time the grade differences according to gender are with the grades A, B, C and F when they are SD+D. While percentages of females who passed and failed are higher than males with grade A, D and F, the percentages of males who got B and C is higher than that of the females. Although the males and females who SD+D on the item, surprisingly 26.8% of males and 38.5% of females passed with grade A. Again when they are SD+D on

the item, only 4.8% of males failed, on the other hand, the percentage of females who failed is very high (15.4%). This shows that females are more conservative than males.

When they A+SA on the online courses are harder and more challenging than the traditional courses, grade differences between males and females are seen on the grades B, C and F. The percentages of males and females are similar for grades A and D. The percentage of males (18.9%) who got grade B is almost half of the females (35.7%), whereas the percentage of males (27.0%) is greater than the percentage of females (19.0%) who got grade C. Although they A+SA on the item that the online courses are harder and more challenging than the traditional courses, 10.8% of male students failed whereas only 4.8% of females failed. Again, this shows that female students do well on what they agree (Fig. 10).

grades. When they are SD+D on the traditional education increases learning level, while 33.3% of females scored grade A, none of the male students scored grade A. For grade B, 25.0% of males scored grade B, but none of the females scored the same grade. 100% of males and females passed the course even though they SD+D. On the other hand, approximately 6.8% of males and females failed when they A+SA. This shows that the learning level increase does not depend on traditional education (Fig. 11)
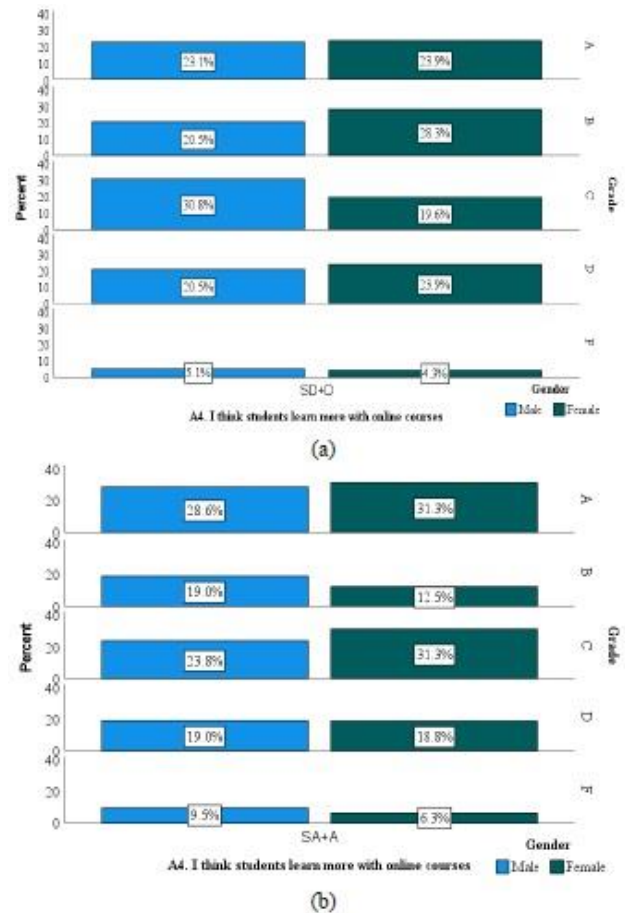

A4. I think students learn more with online courses

(a)

A4. I think students learn more with online courses

(b)

Fig. 12 Learning level distribution of online courses by gender and grades

A3. In-class (traditional) education increases learning level.

(a)

A3. In-class (traditional) education increases learning level.

(b)

Fig. 11 Learning level distribution of traditional courses by gender and grades

Fig. 11 shows the grade distribution of students when they SD+D and A+SA on the item traditional education increases learning levels. There is a gender difference in grades when they SD+D, however, when they are A+SA, there is no big difference in

There is no big grades difference between males and females when they are SD+D and SA+A on learning more with online courses (Fig. 12). It is interesting that the failure rates increased when they SA+A on the item, from 5.1% to 9.5% for males and from 4.3% to 6.3% for females. Although the grade distributions are similar to each other when they SD+D and SA+A on the item, the small grade difference by gender is seen on grade C, while the percentage of males is approximately more than females when they SD+D, it is just opposite when they SA+A.
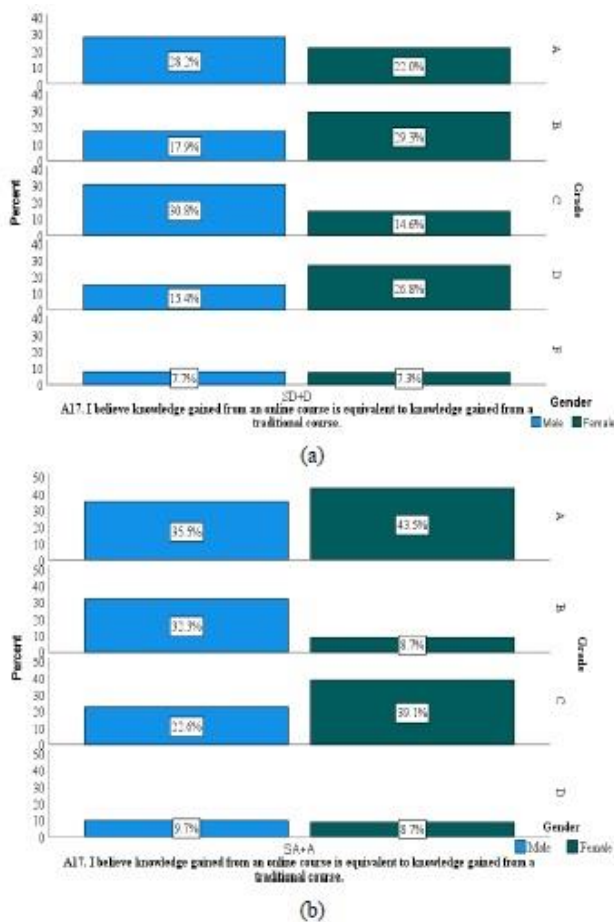
Fig. 13 Distribution of knowledge gained from online and traditional courses by gender and grades

Fig. 14 Distribution of VTC and traditional classes by gender and grades

Fig. 13 shows the grade distribution of males and females when they are SD+D and SA+A on the knowledge gained from online and traditional courses are equivalent. There is gender difference in grades when they are SD+D and SA+A. There is no failing student when they are SA+A, but 7.7% of males and 7.3% of females failed when they are SD+D. The highest percent of passing grade for males is grade C (30.8%), but for female students, it is grade B (29.3%) when they are SD+D. However, when they are SA+A, the highest percent of passing grade is A for both males (35.5%) and females (43.5%). There is also gender difference for grade B and C when they SD+D and SA+A. The passing grade percent of males with grade B is almost half of the females when they SD+D, it is approximately 4 times of the females when they are SA+A. Inversely, the passing grade percent of males (30.8%) with C is almost twice of females (14.6%) when they are SD+D, it (22.6%) is half of the females(39.1%) when they are SA+A (Fig. 13).
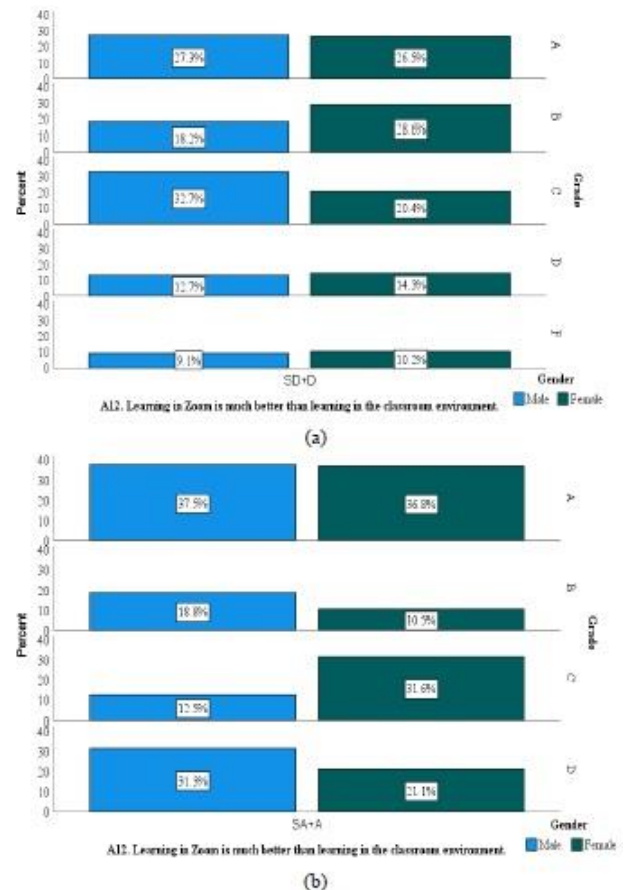
The grade distribution of genders is similar when they SD+D on the learning online with VTC is much better than learning in the classroom environment, but there is a difference for the grades B and C when they are SA+A. The interesting difference is on the passing grades, while 9.1% of males and 10.2% of females failed the course when they SD+D, there is no failing grade when the responses were SA+A. When they are SA+A, with the highest percent of passing grade both males (37.5%) and females (36.8%) scored grade A, but when they are SD+D, 32.7% of males scored grade C whereas 28.6% of females scored grade B. This shows that both males and females prefer online courses with VTC to traditional courses when they SA+A, they easily adapted themselves to online education (Fig. 14).
It is very interesting that the results of preference for the learning online with VTC to traditional courses are different from the preference of in-class courses to online courses. While there is no male failed but 6.3% of females failed when they SD+D, 5.1% of males and 8.1% of females failed when they are SA+A. However, there is no student failed when they are SA+A on the learning online with VTC is preferred to traditional courses. In addition, the

highest percent of passing grade is A for both genders when they are SA+A, but when they are SD+D, the highest percent of passing grades are with 38.9% of males with grade C, and 27.0% of females with grade A. This suggests that the students mostly prefer online courses with VTC to traditional courses (Fig. 15).
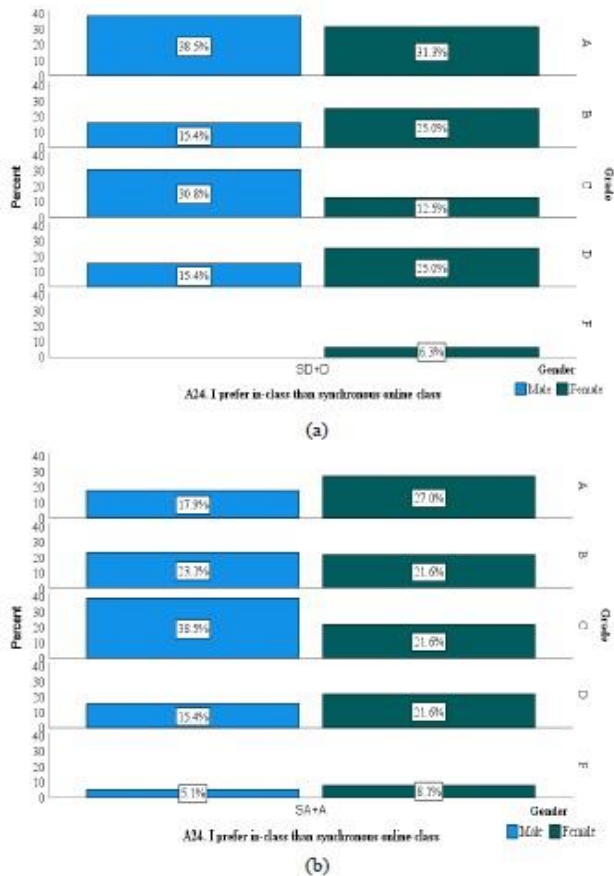

(a)

(b)

Fig. 15 Preference distribution of in-class and synchronous online classes by gender and grades

5 Summary and Conclusion

Online learning has become a viable form of education due to the rapid growth of the Internet and related technology during the last four decades. Wide adoption of wireless tools such as tablet PCs, laptops, web-enabled smart telephones, iPods, iPads, mp3 players, and similar hybrid tools have added a lot more flexibility to online learning. A large number of institutions around the world have started making their courses and programs more student-centric applying the marketing concept to better satisfy their students. When the Covid pandemic started in early March 2020, most of the universities converted their face-to-face traditional education to either synchronous or asynchronous online format. This

sudden change dramatically affected universities, instructors and students. Online education requires substantial investment into hardware and software to support instructors to deliver the course online. Instructors must adapt the curriculum to online format in the middle of the term without receiving any training. Students have been forced to continue all face-to-face courses online during the TT. Since the Covid pandemic is not over, universities have continued online education for almost eighteen months. In 2019 and 2020 surveys, the authors investigated how the perception of students has changed towards online learning and the impacts of technology on online learning before Covid pandemic and in transition term. In this study, it was hypothesized that, students' preferences in terms of online learning by gender and number of online courses taken, traditional and online education by gender and grades might have changed from TT to DC. It is also hypothesized that students' learning with the use of LMS for online learning.

Some of the findings and conclusions are summarized in terms of the agreement level decreased and increased below:

The agreement level of students decreased from TT to DC for the following statements:
- Online education increase learning levels
- Students learn more with online courses
- Classroom equips with internet access enrich learning
- Online courses are easier than traditional courses
- Knowledge gained from an online course is equivalent to the knowledge gained from a traditional course.
- Professors add an online discussion forum

The agreement level of students increased from TT to DC for the following statements:
- Traditional education increases learning level.
- I value face-t-face interactions with professors and peers in a classroom environment.
- Interaction with other students in a classroom environment is easier than in an online environment.
- Online classes are harder and more challenging than the traditional classes.
- Students who take online courses are not well-equipped to learn online compared to the traditional courses due to lack of interactions with professors and classmates.
- Pre-posted audio or video recorded lecture slides help students a lot to understand the topics.

- Professors should post the course materials on the course site for both traditional and online education.

In terms of gender, in the case of the agreement level decreases for males and remains the same for females for that online education increases learning levels, and classroom equips with internet access enrich learning. The agreement level of both males and females decreases for knowledge gained from an online course is equivalent to the knowledge gained from a traditional course. On the other hand, while the agreement level of males decreases, it decreases for females for online courses are easier than traditional courses and students learn more with online courses. This shows that females are more adaptable to the online courses and more conservatives than males.

In terms of the number of online courses taken in the past, the agreement level of students who took less than 5 and greater than 5 online courses, both decreased in agreement from TT to DC for online education increase learning levels, and knowledge gained from an online course is equivalent to the knowledge gained from a traditional course. The agreement level of students who took more than 5 courses increases but it decreases for the students who took less than 5 courses for traditional education increases learning level, classroom equips with internet access enrich learning, interaction with other students in a classroom environment is easier than in an online environment, online classes are harder and more challenging than the traditional classes. One reason for this difference is that students who took more than 5 online courses have more experience than the students who took less than 5 online courses. Therefore, they adapted the online courses better than the students who took less than 5 online courses.

The agreement level of students for LMS and online platforms are easy to use, reliable and effective learning tool is very high in both TT and DC. However, they mostly disagree that learning in LMS and VTC are much better than learning in class environment. Generally, the students mostly prefer traditional courses to online courses. However, they prefer synchronous online courses to asynchronous courses. Moreover, interaction is very important to them. Students like face-to-face interaction, they do not want to learn the materials by themselves. Students do not like the discussion board in LMS in TT and DC. Instead, they prefer to use other social media for communication, like Facebook, WhatsApp, and Twitter.

From the viewpoint of grades, the gender difference compared with the grades in TT and DC, the grades in TT are much higher than the grades in DC. When the genders are compared according to the grades in TT and DC, there is a big difference in genders according to the grades in TT, however the grades of males and females are similar in DC. While there was no female students failed or scored with D grade, 5% of males scored with D grade and 10% of them failed in TT, and while 32.3% of females scored with grade A, 50% of males scored with grade A. Taking all courses online changed the grade distribution negatively for both males and females. Instructors have increased their online assessment skills since the TT, and have more experience to use the online assesment tools, such as protractoring, lockdown browser, question library, sequential exams, in DC to prevent students violating the academic misconduct.

It is interesting that when the males disagreed on online classes easier than traditional courses, 36.7% of students scored grade A, and when they agreed, the percentage of grade A reduced to 32.4%. Inversely, 23 % of the female students when they disagreed that online courses are easier than traditional courses, passed with grade A, when they agreed it increased to 41.7%.

There is a gender difference in grades when the students agreed and disagreed on the knowledge gained from online and traditional courses are equivalent. There is no failing student when they agreed, but 7.7% of males and 7.3% of females failed when they disagreed. The passing score of males with grade B is almost half of the females when they disagreed, it is approximately 4 times of the females when they agreed.

The main contribution of this study is that there are gender and number of online courses taken to evaluate the differences for the preference of online learning. Students' preferences mostly changed negatively for online learning from TT to DC. When they agreed the online learning easy in TT, majority of the students disagreed in DC. Taking all courses online negatively changed their preference of online education from TT to DC. They are struggling with online learning during the Covid pandemic. Students were not ready for a fully online education even though they have experience with online learning. They all agreed to traditional courses increased their learning and LCM , online platforms and especially VTC help them to learn the materials in both TT and DC. They perceived technology supported by instructors are sufficient for online learning. Finally, their grades are impacted with online learning due to anline assessment tools, like proctoring and lockdown browser.

This paper is limited in investigating the changes of students' preferences for online and traditional

eduction from TT to DC by gender, the number of the online courses taken and the grades earned. Future studies can be extended to study online education with more qualitatively and quantatively for periods of before covid (BC), TT and DC as follows:

- How the grades are affected by attending live classes
- How the grades are affected by the study times for online courses
- Perceptions of students on online assessments
- Perceptions of students on synchronous and asynchronous online courses.
- The role of online assessments (e.g tests and exam) on students' stress level.
- The impact of online monitoring of tests and exam on students' stress level
- The impact of online courses on students' mental health.
- Online education impacts on cheating, and the solution methods of reducing cheating.
- Impacts of hologram technology on online learning.

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Contribution of individual authors to the creation of a scientific article (ghostwriting policy)

Author Contributions:
Nursel Ruzgar and Clare Chua prepared the survey and applied, did statistics, and interpret together.