



Research Article

# Nursing Students' Anxiety about Distance Education during COVID19: A Quasi-Experimental Non-Equivalent Group Pre/Post-Survey

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## Abstract

**Background:** Nursing education that moved online during the COVID19 pandemic was a technical success. However, nurses may have suffered increased anxiety in the months following the initial rollout of the courses. Faculty that want to best prepare nurses for the clinical setting could prepare nurses for the increased anxiety that accompanies an online course. **Objectives:** The objective of this study was to determine to what extent Emirati nursing students perceived level of anxiety changed following a rapid transition from in-person to distance education. **Design:** A quasi-experimental non-equivalent group pre/post survey bracketing moving to an online distance education model for United Arab Emirates (UAE) female nursing students. **Methods:** Measurement of age used independent t-test. The cohort and campus variables were Likert scales compared with chi-squared analysis. Perception of expenses used Fischer's exact test. Measurement of the overall anxiety score used a one-sample t-test comparing the means of the pretest against the respondents' posttest scores due to the inability to match pre-post participants as the survey was anonymous. **Results:** The research showed a significant ( $t(232)=7.580, p<0.001$ ) increase in anxiety from the pretest score ( $M=7.77, SD 3.985$ ) to the posttest score ( $M=9.93, SD 4.344$ ) in anxiety overall score (range 0-21) after using the distance education software for one month. **Conclusions:** Traditional distance education typically only focuses on IT training before going live. The literature generally assumes that there is a decrease in anxiety as students become more comfortable with using distance education software. This study challenges that view. This study demonstrated that additional training and interventions are needed to assist the increased anxiety experienced after go-live when Emirati nursing students have used distance education software. This increased anxiety may be to difficulty using the software for submitting assignments or taking exams whose requirement conflicted with their cultural norms (cameras in the home).

**Keywords:** COVID-19; Anticipatory anxiety; Cultural competence; Online education; United Arab Emirates

## Introduction

COVID19 has required faculty to move to distance education without pedagogical consideration of the impact of mental health

on nursing students. Learning management system rollouts are focused on login, usability, uploading content, and evaluations. Once the course is up and running, few considerations of the end-users emotional wellbeing are taken into account. Spyware capturing laptop screens, cameras recording intimate personal spaces, microphones overhearing domestic arguments, background

displays revealing socioeconomic class, and proctoring software stating the risk of expulsion for cheating on tests, all increase stress on students after they have started distance education. Faculty may consider assessing the mental health and anxiety of their students a month after launching an online class and before online examinations. This study determined to what extent nursing students in the United Arab Emirates (UAE) anxiety increased during the rapid shift from in classroom to online distance education.

## Literature Review

Distance education for undergraduate nurses has been utilized effectively for many years [1-3]. Distance education was defined for this study as 100% online learning following the Ministerial Decree 237 from the UAE Ministry of Education. The availability and utilization of distance education or online learning vary around the world and among colleges [4]. Often, distance education is leveraged to help access students who are not physically present in the room with the instructor [5]. A faculty member who only uploads a PowerPoint or pre-recorded video to the site may face resistance from the students if there is little other support or teaching offered [1,6]. The student perception of distance education is often initially one of anxiety [3]. A 2018 survey of 80 female nursing students in Saudi Arabia showed only 25% of students had a satisfactory usage of the Blackboard system (the same system used in this study) [6,7]. Distance education doesn't end at successfully logging into an LMS.

Faculty should also consider the cultural specifics of their students. Faculty need to continue to assess students' understanding and emotional needs throughout the course. The United Arab Emirates (UAE) is located on the Arabian Peninsula, and Islam is the official religion. The scope of gender and cultural norms of the UAE is outside the scope of this paper. However, consideration or potential violations of cultural norms should be considered as potential areas of stress. Cultural stress can occur with the student's appearance on camera when different genders are present, viewing the private residence of students when cameras are on during class, and hearing family discussion inadvertently through the microphone [8]. Exam proctoring software that records students (and their families) in their home is particularly concerning, especially when demonstrating physical assessment laboratory skills.

Student anxiety in online learning can be defined as a state of unease or worry about an unknown outcome [9]. Previous studies have identified barriers to UAE students seeking help for anxiety [10]. This help-seeking is especially the case for anxiety and other mental health concerns. The study proposes, "mental health concerns are commonly viewed as a breakdown in an individual's religious faith" [10]. The authors recommend actively reaching

out to this community to normalize and assess levels of anxiety in an effort to provide support. The current global pandemic of the SARS-CoV-2 virus leading to the COVID19 disease has increased anxiety and the changing of typical educational models [11]. Nursing students who are not adequately learning online and then go to a clinical placement or workplace may place themselves and patients in significant danger [12]. Because of this increased anxiety and risk to patients, nursing faculty need to help nursing students decrease their anxiety with the learning management systems so that the faculty can better prepare the nurses for their accelerated entrance into the clinical settings.

A theoretical model to help assess the anxiety with new technology is the Technology Acceptance Model (TAM) [13]. Derived from Fishbein's theory of reasoned action, the TAM stresses that the end-user must see the value of and use of the systems without trouble to adopt new technology effectively. The first hybrid TAM model for nurses was in 2008, demonstrating, in part, the significant factors of computer anxiety, computer self-efficacy, and perceived financial cost against the intention to use online courses [3]. The first online nursing program in Turkey surveyed its students (N=1,041) and found nurses can become comfortable with online learning if given good examples, training, and relevance [2]. A 2014 Turkish study of 148 nursing students starting their first online course found positive expectations of the course as well as elevated anxiety at the beginning of the course [9]. A 2015 Canadian study of 197 registered nurses focused on perceived usefulness and perceived ease of use and demonstrated a positive correlation with prior computer experience and higher educational degrees [14]. A 2016 study of Chinese nurses adopting Personal Digital Assistants (PDA) showed younger nurses and those nurses with previous experience with PDAs increased acceptance of PDAs [15]. The authors note that different training based on correlative factors of each nurse increased acceptance. A 2018 study in Finland found organizational support a key success variable for both nurses and patients in finding benefits of internet-based support courses [16]. Contrasting these findings, a 2019 Canadian study of 217 working registered nurses found no significant correlation among age, prior computer experience, or level of education and expectations of intention to use an electronic documentation system [17]. The TAM finds that assessing and correcting for computer anxiety is key to transitioning nurses onto new technology platforms. The TAM forms the basis for the instrument used in this study.

## Methods

The total student population was 850 Emirati women located across four campuses in the United Arab Emirates and enrolled in an undergraduate nursing program before and after a mandatory transition to distance education. Participants were recruited through program-wide emails, WhatsApp from teachers, and

postings on the learning management system homepage. Both pre and post-intervention surveys were online (mobile and web). Data were collected by the third party survey tool (Survey Monkey) on a corporate account with controlled access. IRB approval #INTSTF002BSN20 was awarded.

Traditional face to face teaching was underway for six weeks prior to the start of the study. The intervention was a forced and rapid change to distance education through online classes leveraging the Blackboard learning management system. Participants were all required to transition from face to face to distance education over two weeks. Faculty also transitioned teaching materials online, generally giving synchronous webinars over the next eight weeks. This study compared anxiety levels one week before distance education started, and one month after attending distance education started.

## Objectives

The objective of this study was to determine to what extent Emirati nursing students perceived level of anxiety with new technology changed following a rapid transition from in-person to distance education as measured by pre and post-survey scores.

## Outcomes

The primary outcome was a change in overall anxiety index score following distance education. Secondary outcomes were individual sub-scores on the instrument. Three subgroups were in the survey; i) computer anxiety, ii) self-efficacy, and iii) financial considerations. The subgroups were then added to form the anxiety index score. Questions were derived from the technology acceptance model and previous models. Answers were recorded on a five-point Likert scale. Validity, reliability, and psychometrics were previously reported [3]. The survey was a pre-post survey design, two-tailed, with one group. No personally identifiable information was gathered. The sample size was estimated at 278, determined through SPSS Sample power 3 with a power level of 70%, p-value 0.05%, small effect size of 0.1, total female Emirati undergraduate nursing student population of 850, and two-tailed [18]. Given an expected response rate of 35%, reaching the target completion rate required 297 (35% of 850) participants. 285 (33%) participants completed the pre-survey, and 233 (27%) participants completed the post-survey.

Demographics recorded included age, campus, and cohort. However, the unit of analysis was taken as the entire group. Combining into one group was chosen as there were no significant differences in age or campuses among the sample. An objective of the study was to assess student anxiety across the entire student body, so the unit of analysis was the whole student body. The survey asked about mental health issues (anxiety), and therefore participation was anonymized. The survey software assigned

a participant ID that, while unique to the user, researchers were unable to match the ID to a particular participant. All cross-tabs of age, cohort, campus were over ten respondents. Anonymity precluded matching pretest and posttest participants. Therefore the mean of the pretest was compared to the posttest for change in score (one-sample t-test).

## Statistical Methods

Participants were between 17 and 33 years of age with the pre-survey group (n=285) (M=20.69, SD=2.915) not significantly older than the post-survey group (n=233) (M=20.48, SD=2.176). The pre-survey group was continuous and normally distributed (skewness=0.302, kurtosis= -0.028) as was the post-survey group (skewness=0.073, kurtosis= -0.358) with Levene's test not significant (F=0.513, sig=0.474). Pre-post survey age were compared using independent t test.

Participants also indicated their class cohort though nominal categorical collection. Pre and post cohorts were compared with a chi-squared comparison of means. The pre-survey participants were over-represented in the final year (BN4) class, while the post-survey were over-represented in the first year (BN1) cohort. As such, the cohort was not used as a covariate or factor in future analyses.

The campus the participants previously had attended class at data was collected through nominal categorical collections. Pre and post groups were compared with a chi-squared comparison of the mean. There was no significant difference among campuses or between pre and post surveys. Regardless, the campus was not used as a covariate or factor in future analyses.

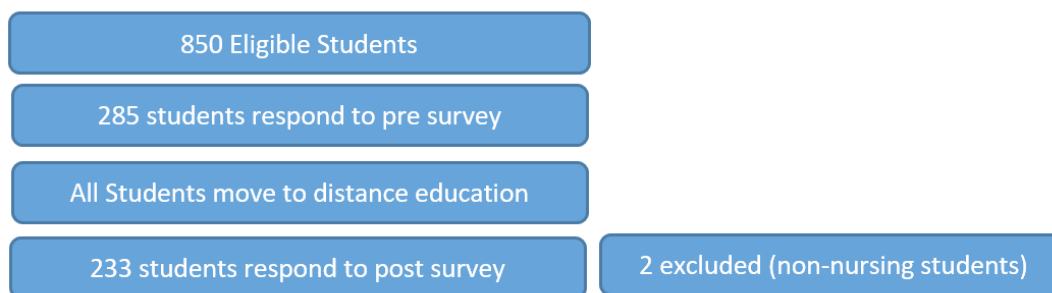
The sample groups surveyed were independent of each other. There were no participant's relationships that answered both the pre-survey and the post-survey as identified by the survey software respondent ID. Questions one through five were sampled at two times (pre and post) and collected on Likert scales as ordinal values ranking higher scores as higher levels of anxiety. Over 200 responses on both pre and post as well as five categories per question. Question six allowed for two answers only and therefore used a fisher's exact test. Cronbach alpha was borderline at 0.681. Means of the pre and post results were compared for significance for each question. Consideration of increased Type 1 error is covered in the limitations section.

The anxiety index score is the sum of the scores of the six questions ranging from 0-21. This index was scored as an interval ordinal data. Pre-survey score was calculated on 285 samples (M=7.77, SD= 3.985) and was normally distributed (skewness=0.302, kurtosis= -0.029). Post-survey score was calculated on 233 samples (M=9.93, SD=4.344) and was normally distributed (skewness=0.195, kurtosis= -0.479). The Shapiro-

Wilk test of normality suggested skewness in both pre-survey ( $W(285)=0.979, p<.001$ ) and post-survey ( $W(0.981)=0.233, P=0.003$ ). However, the sample sizes were over 200 participants, with normal skewness and kurtosis. Therefore, normality was assumed, and parametric tests were run [19]. As there was no personally identifiable information, posttest scores were compared to the mean of the pretest scores. There was no historical reference value for the anxiety index score. The pre-survey mean score of 7.77 was used as the expected Test value. Assuming normalcy of the data, a one-sample t-test (two-tailed) test was used with a 0.05 [2,20]. IBM SPSS v26 was used.

## Results

### Participant Flow



### Recruitment

This study was conducted during the 2020 COVID19 outbreak in the UAE. 1<sup>st</sup> March all extra-curricular activities were cancelled. March 8<sup>th</sup> students were sent home for two weeks of spring break. March 10<sup>th</sup> IRB approval was awarded. March 18<sup>th</sup> the pre-survey was administered. 22<sup>nd</sup> March distance learning online classes started. 23<sup>rd</sup> April the post survey was distributed.

This study found that the age of nursing students did not differ significantly  $t(516)=0.914, p=0.361$  in the pre-survey group (20.7±2.91 years of age) from those in the post-survey group (20.5±2.18 years of age). Class cohort data did differ significantly  $\chi^2(3, N=233)=12.76, p=0.005$  in the pre-survey group from those in the post-survey group. Cohort data were thus excluded from any further analysis. Campus data did not differ significantly  $\chi^2(3, N=233)=0.93, p=0.818$  in the pre-survey group from those in the post-survey group.

Characteristic	Categories	Pre-Survey (n=285)		Post-Survey (n=233)		t/X <sup>2</sup>	p
		N (%)	M±SD	N (%)	M±SD		
Age (year)		285 (100%)	20.7±2.91	233 (100%)	20.5±2.18	.914 <sup>†</sup>	.361
Cohort (year)	BN1**	63 (22%)		79 (34%)		12.76	.005*
	BN2	68 (24%)		59 (25%)			
	BN3	56 (20%)		42 (18%)			
	BN4	98 (34%)		53 (23%)			
Campus	Abu Dhabi	50 (18%)		48 (21%)		.931	0.818
	Ajman	84 (30%)		68 (30%)			
	Al Ain	92 (32%)		69 (29%)			
	Al Dhafra	59 (20%)		48 (20%)			

\*\* BN1 represents a first-year student in the Bachelor of Science in Nursing

\*Significant at 0.05 level

<sup>†</sup>t test used for age

**Table 1:** Chi-squared analysis of pre and post groups.

This study found that significantly increased apprehension, increased fear of making mistakes, increased intimidation with the LMS, decreased proficiency, and decreased confidence were reported following using distance education for one month. The data also showed an increased perception of expense while participating in distance education.

Question	Range (0=no anxiety)	Pre (n=285) Post (n=233)		X <sup>2</sup>	df	p
		M±SD	M±SD			
I feel apprehensive about using online courses	0-4	1.64±1.374	1.84±1.198	19.783	4	<.001
I hesitate to use online courses for fear of making mistakes that I cannot correct	0-4	1.29±1.334	2.15±1.254	65.152	4	<.001
Online courses are somewhat intimidating to me	0-4	1.25±1.227	1.84±1.293	28.374	4	<.001
I expect to become proficient in using nursing courses	0-4 0=Very Proficient	1.56±1.151	1.88±1.214	14.589	4	<.001
I feel confident that I can use Blackboard to study my online courses	0-4 0=Very Confident	1.31±1.243	1.70±1.325	14.824	4	.005
I think the equipment required to use online courses is expensive	0-1 0=Not Expensive	28%	47%	Fischer's (2-sided)		<.001

**Table 2:** Comparison of Survey Questions.

A one-sample t-test was run to determine the extent to which an anxiety index score was different from the pre-established normal, as defined by a score of 7.77. Anxiety index scores were normally distributed as defined by the skewness of 0.302 (SE=0.14) and kurtosis of -0.029 (SE=0.28) with no outliers as assessed on a boxplot. Mean anxiety index score (M=9.93, SD=4.34) was higher than the normal anxiety index score (M=7.77, SD=3.98), a statistically significant mean difference of 2.15, 95% CI (1.60 to 2.72], t(232) = 7.58, p<0.001.

Variable	N	MIN	MAX	Mean	SD	Skewness		Kurtosis	
						Statistic	Std. error	Statistic	Std. error
Pre Anxiety Index Score	285	0	21	7.77	3.985	0.302	0.144	-0.029	0.288
Post Anxiety Index Score	233	1	20	9.93	4.344	0.195	0.159	-0.479	0.318

	t	df	Sig (2 tailed)	Mean Difference	95% CI	
					Lower	Upper
<b>Post Anxiety Index Score</b>	<b>7.580</b>	<b>232</b>	<b>&lt;0.001</b>	<b>2.157</b>	<b>1.60</b>	<b>2.72</b>

**Table 3:** Anxiety Index Score one-sample t-test.

## Discussion

All of the questions and cumulative scores postulated by the research question were supported by the data generated in this study. These data indicate there was a perceived increase in anxiety between starting and actually participating in distance education. The increase in anxiety is not expected as typically users report a decrease the more they use a computer system [1,2]. Additionally, the higher levels of anxiety during the semester disincentivize students to continue to participate in distance education (Tung & Chang, 2008). Faculty and administrators are worried about re-enrollment or clinical readiness if distance education is used; however, they tend not to address this increased anxiety for the currently enrolled students.

The fear of making mistakes appears to be an area of particular concern to the students. Blackboard and most LMS are designed with multiple levels of access control to prevent students from making mistakes. One area that a student could cause an error with significant consequences is during an online examinations. This college utilized Respondus Lockdown Browser with Monitor. This software is a virtual invigilator (proctor) that tracks and records the student during tests. Experience in administering exams demonstrated 'mistakes' that report red flags such as: if the student were to look away from the screen, have a sibling walk past them as they take the exam in their house, click another program, momentarily lose internet access, or accidentally submit/close the exam before they completed the exam. The system would red flag the exam and report their actions as suspicious and may not allow them to re-enter the exam. The faculty would either, 1) require a re-test at a later date or 2) the faculty would have to manually override the system to allow another attempt.

Faculty also heard numerous feedback regarding cameras recording students in their houses. The pre-survey timing indicated from the Ministry of Education that cameras were not required for examinations; however, the post-survey timing indicated the Ministry required cameras for some exams. Emirati nursing school students are typically young (20 years old) and in Abu Dhabi, all female. Cameras record appearances and as such, the students usually would wear their sheila head cover and makeup for exams. The cultural considerations for filming young women in their homes may need a future study to decrease this anxiety.

This study also showed an increase in financial considerations of distance education. This finding was surprising as students did not need to pay any additional fees to take the courses and in some cases, may have saved fees by not needing to pay for housing or bus transport fees. However, during the semester, some students reported that they needed to buy a better computer at home to meet the requirements of Blackboard and Respondus lockdown browser with the monitor. For example, their computer did not have a working camera. Others reported that their wifi connection was not fast enough to support lectures and had to use tethering to their mobile phones for a 4G connection. The UAE Government and telecom providers did increase the free bandwidth to specific educational websites to help ally this cost.

The study did find significant changes; however, statistically significant findings may not be practically significant. A sample size of over 250 participants may indicate significance, even at threshold amounts. Increasing the power of this study was the interaction of faculty and students and the qualitative feeling of increasing stress levels. Increasing stress could be demonstrated by numerous emails asking for changes, students' responses at town halls, or desperate phone calls during exams when students were locked out prematurely due to mistakes. Erring on the side

of highlighting increased stress with distance education results in more attention to students' well being with minimal downside risk. This study showed a low cost with high participation survey can be used to check in on students' feelings about anxiety and could easily be duplicated if distance education continues.

## Conclusions

This study supported including perceived anxiety into technology adoption models and proposed that student's mental health should be included in the roll-out plans for distance education. This study also recommends that consideration of cultural norms should be given significant attention when designing distance education examinations. Virtual proctoring has no perfect answer, and the camera is the best solution we currently have. However, that does not mean that students' should be excluded from the discussion about the use of cameras. Hearing their perspectives may result in alternative methods of ensuring fair examinations or at least decrease their anxiety about the use of cameras.

Distance education during the COVID19 pandemic started dramatically and with little time for psychosocial considerations. Future studies and distance education plans will have more time to consider the students' perspectives and feeling as we move forward. Distance education is not just putting face to face pedagogy materials online. Distance education can allow new teaching and evaluation methods to better suit the individual needs of each student. Blue-sky thinking about alternative assessments could include: untimed tests, randomization of a valid pool of questions, multimedia projects, social media campaigns, or exams conducted at 2 am when no one else is awake using bandwidth in the house. Students that have significantly different access to at-home resources (private room, high bandwidth, fast computers) should be allowed various accommodations so that assessments are fair to everyone. The act of asking about anxiety may be enough to decrease anxiety.

## Limitations

The participants in the study were nursing students who were asked to answer a questionnaire given by their faculty members. While no names were collected and IP addresses were masked from analysis, there is the potential of undue pressure to complete the survey, and the high response rate may indicate this. This is also a limited scope as the cultural consideration of women in the UAE may limit the generalizability to western countries or eastern/southern Asian nursing students. However, this study does inform software and credentialing agencies of the uniqueness and cultural competency needed for nursing in the UAE.

The statistical tools of repeated chi-square analysis on the same sample size does increase the risk of a type-1 error (false positive finding). An alternative would have been to use an

ANOVA (or ANCOVA). The data were surveyed Likert questions and did not meet the requirements for a parametric test. The individual questions also provide a context for faculty to create specific interventions based on the target of the questions. That is, the finding of fear of making mistakes may lead faculty to cover what happens if an error is made and how the faculty can correct that mistake in real-time so the student is not punished. Listing the individual question and their significance also helps in the creation of future surveys and course evaluation questions that are distance education specific. Finally, the trending of the anecdotal, individual questions, and summarized anxiety index score all point to a trend of higher anxiety during the use of distance education. All measures are indicating increased anxiety reinforce the acceptance of the possibility of a type-1 error.

This study was conducted during the initial weeks of a pandemic. There was much uncertainty and anxiety about a myriad of issues during this time. The pre-post nature of this survey attempted to correct for that. The authors could not control for every covariate that may affect anxiety. Future studies may confirm or reject this increased anxiety during the initial rollout of distance education. The main conclusion of the study remains however, that when faculty are starting a new program of distance education, both technical and psychosocial considerations of the students should be considered.

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