Undergraduate Nursing Students' Satisfaction with blended e-learning following the Covid-19 pandemic

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Abstract

Background: Blended learning has recently been introduced as an addition to the existing teaching programme of nursing students at X University. The aim of this study is to assess student satisfaction with this change.

Methods: A 35 item questionnaire was circulated to all male and female nursing students in their 2nd, 3rd and 4th years of study. The questionnaire was subdivided into the five domains of Interaction, Instruction, Instructor, Course Management and Technology.

Results: Mean satisfaction scores for male and female nursing undergraduates was significantly greater than 3 (neutral score) in all domains of enquiry indicating good satisfaction with blended learning ($p<0.001$). Domain scores were also significantly greater than those of a comparator study in four of the five domains ($p<0.030$) and similar in the domain of Technology ($p=0.677$). Male and female levels of satisfaction were similar in 80% of the survey questions, but female satisfaction was significantly lower in some questions concerning technology ($p<0.003$), willingness to interrupt the instructor ($p=0.021$), comparison of blended learning and face-to-face teaching ($p=0.002$) and timely feedback on tests and assignments ($p=0.031$). Fourth year students showed highest levels of satisfaction across all five domains. Overall questionnaire reliability exceeded 90% and matched that of a comparable study elsewhere.

Conclusion: Undergraduate nursing students reported high levels of satisfaction and demonstrated nascent technological skill, resilience and fortitude when presented with the immediate implementation of an unfamiliar e-learning blended curriculum environment.

Introduction

The rapid development of information and computer technology (ICT) and the increased percentage of college students with advanced prior knowledge of computers and the internet has helped develop enriched teaching and learning experiences, creating for many a better quality education [1]. Educational systems worldwide are investigating computer-based assessment due to the potential and proven benefits of this approach. These benefits include cost and time savings resulting from automated delivery, accurate scoring of students' grades, and providing faculty members with immediate feedback about students' performance and averages [2].

Education curricula in nursing and in higher education are delivered using several teaching approaches such as traditional classroom lectures, laboratory and practical sessions, small group teaching and tutorials all of which are increasingly using electronic means for promoting learning. This has led to another learning dimension which has been described in the literature as 'blended learning'. There are numerous definitions of the term and debate continues about its theoretical basis because of the various mixed learning assumptions and methods that are used [3]. Graham, however, provides a simple definition that is used frequently in the literature, namely that "Blended learning systems combine face-to-

face instruction with computer-mediated instruction" [4]. The term blended learning is generally applied to the practice of using both online and face-to-face learning experiences when teaching students. The context for this research into satisfaction with blended learning arose following the rapid introduction of e-learning in Nursing Fundamental curricula including theoretical lectures, clinical practice sessions and to a lesser extent, case presentations and critical discussions. Its purpose is to understand and obtain feedback on the student experience through assessment of their satisfaction with the rapid introduction of e-learning to their curriculum. Findings of this survey give a clear insight into nursing students' capability to engage with a new e-learning process within a blended curriculum and suggest the presence of nascent talent within undergraduate students.

Methods

Design: This is a descriptive study using a questionnaire developed for the assessment of student satisfaction with blended learning courses at the College of Information Technology (CIT), UAE, and which focussed on various aspects of their blended learning program. This questionnaire was considered suitable for use in the evaluation of student satisfaction in the Faculty of Nursing following an immediate implementation of an e-learning format additional to a traditional lecture, practical and laboratory based programme [6].

Context: The learning situation for undergraduate students in campus-based learning occurs within the presence of interacting people, structures and processes. When introducing changes to the learning process it is important to recognise their integration within the existing provision as rarely does the impact of change rely on one factor independently of other influencing factors. The implementation of e-learning integration within the nursing programme at X University was undertaken in collaboration with the key stakeholders in the environment as illustrated in Fig. 1.

The transfer to e-learning was necessitated by the urgent requirement for social distancing as a result of the Covid-19 pandemic. Staff and students were no longer able to be present on campus and online learning was introduced with almost immediate effect. Faculty and students were therefore required to make changes with little notice or time for preparation or training. Online learning was facilitated using Blackboard (https://www.blackboard.com/teaching-learning) with some support in project/group work from WhatsApp (https://www.whatsapp.com) according to methods previously described [5]. Blackboard is a multimedia curriculum-driven learning system that allows faculty to provide online education. Material in a variety of formats e.g. Powerpoint, video, audio, reference material and other applications are created elsewhere and then delivered online via Blackboard in 'real-time' and also made accessible as an educational resource. Blackboard enhances communication through notice boards, discussion forums, virtual classroom and email. Via Blackboard faculty and students can interact entirely online, course materials and resources can be delivered in an online format, students can interact and collaborate online and also student assessment can be undertaken online. Therefore many of the key components in the delivery of learning can be provided by online processes.

Ethical considerations: The study was conducted in accordance with the methods and procedures for human research [7]. Ethical approval was granted by the Research Ethic Committee of the Faculty of Nursing. Notification of the purpose of the study and its active time period were made via WhatsApp. Students were informed that participation was voluntary, anonymous and separate from their academic studies. Completion of the online questionnaire was considered to be consent to participate in the research study.

Participants: The questionnaire was circulated to all male and female undergraduate nursing students enrolled in the 2nd -4th years of the B.ScN (Hons) programme at Umm Al-Qura University (478 students in total). Fully completed responses were received from 199 female and 84 male (total 283) giving a response rate of 59.2%. Participants further divided into 32 male and 58 female students (total n = 90) from 2nd year, 37 male and 66 female students from 3rd year (total n = 103) and 15 male and 75 female students (total n = 90) from 4th year. Students were advised that the survey was open only to undergraduates 18 years of age and older.

Questionnaire: The questionnaire used in this survey comprised 35 statements of which 28 (n = 28) were positively framed and 7 (n = 7) were negatively framed. Each statement required a response on a 5-point Likert scale ranging from strongly agree (5), agree (4), neutral (3), disagree (2) to strongly disagree (1) for positive statements and the reverse for negative statements. The questionnaire was subdivided into the domains of Interaction (9 statements), Instruction (12 statements), Instructor (5 statements), Management (3 statements) and Technology (6 statements) each measuring various aspects of student satisfaction with blended learning. The survey was developed using Google Forms (https://drive.google.com).

Data collection: Data were collected online via a self-completed validated questionnaire canvassing student satisfaction with the addition of e-learning to the curriculum [6]. WhatsApp was used to circulate contact details for students and an information sheet informing participants about the purpose of the study, what participation would entail and to assure them that all data would be collected anonymously. Should they wish to participate an electronic link to the satisfaction questionnaire was included. Proceeding to use the link, to access and to complete the questionnaire was accepted as informed consent to participate in the study.

Statistical methods: Mean values and standard deviations were computed for responses to each of the 35 statements for male and female students separately and together after taking account of re-scoring for negative questions. Differences between male and female responses to questions were tested and statistically significance assessed at the 95% level of confidence using t-tests ($p < 0.05$). Questions were then assigned to one of five domains, and descriptive statistics for each domain were calculated separately for male and female participants and together by aggregating the scores of all questions in that domain. Student's t-tests were used to assess gender differences in mean domain scores, differences in mean domain scores between different undergraduate years of study and across domains within a year of study. Domain reliabilities were assessed using Cronbach's alpha criterion.

Results

Analysis of questionnaire responses: Mean responses and their standard deviations were calculated for each statement ($n = 35$) on a scale from of 1 to 5 and are presented in Table 1. Mean male and female responses were also compared for each statement and the average response to each statement taken over all students was compared with the mean CIT response. The mean nursing student response for each statement was statistically significantly greater than 3.0 (mean response) at the 95% confidence level ($p < 0.05$). The exceptions occurred in items S11 and S20, namely “My understanding is improved compared to similar courses I studied before” and “Compared to face-to-face course settings, I am less satisfied with this learning experience”. In each case the mean score was below neutral (3.0) but not significantly so in the case of the former, but very significantly so for female students in the case of the latter ($p < 0.001$).

Table 1

Title: Male and female questionnaire responses and comparative statistics.

The statements comprising the questionnaire together with mean, standard deviations and gender comparisons of the nursing student responses and their CIT comparators. T-tests comparisons of mean responses are between columns 2 and 3 (Nursing and CIT students) and between columns 4 and 5 (male and female nursing students).

	Nurse sample (n = 283)	**CIT 2012 (n = 108)**	**Nurse Male (n = 84)**	**Nurse Female (n = 199)**	**Male/female Nurse comparison**
Questions	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**p-value**
Interaction Domain (S1-S9)					
S1. A blended learning session keeps me always alert and focused.	3.43 (1.08)	2.60*** (1.25)	3.55 (1.07)	3.38 (1.08)	0.236
S2. Interaction is adequately maintained with the lecturer when he/she is on the other side of the blended learning classroom.	3.63 (1.02)	3.00*** (1.27)	3.67 (1.08)	3.62 (1.00)	0.724
S3. Having students from the opposite gender on the other side of the blended learning classroom listening to what I say might restrict my participation.	3.21 (1.23)	3.45 (1.35)	3.27 (1.26)	3.18 (1.22)	0.568
S4. A blended learning course makes it more important for students to visit the lecturer during office-hours.	3.30 (1.08)	3.45 (1.26)	3.11 (1.05)	3.30 (1.10)	0.954
S5. I cannot interrupt the lecturer to ask a question when he/she is on the other side of the blended learning classroom.	3.55 (1.16)	3.30 (1.52)	3.80 (1.17)	3.45** (1.15)	0.021
S6. I am satisfied with the quality of interaction between all involved parties.	3.68 (1.00)	3.10*** (1.17)	3.61 (1.12)	3.71 (0.94)	0.466
S7. I am dissatisfied with the process of collaboration activities during the course.	3.33 (1.15)	3.40 (1.31)	3.42 (1.19)	3.29 (1.13)	0.395
S8. I am satisfied with the way I interact with other students.	3.77 (0.99)	3.60 (1.13)	3.69 (1.09)	3.81 (0.95)	0.385
S9. I am satisfied with my participation in the class.	3.93 (0.96)	3.35*** (1.28)	4.05 (0.94)	3.88 (0.96)	0.186
Instruction Domain (S10-S21)					

* $p < 0.050$, ** $p < 0.010$, *** $p < 0.001$

	Nurse sample (n = 283)	CIT 2012 (n = 108)	Nurse Male (n = 84)	Nurse Female (n = 199)	Male/female Nurse comparison
S10. Use of blended learning technology in this course encourages me to learn independently.	3.77 (1.12)	3.15*** (1.16)	3.80 (1.19)	3.75 (1.09)	0.772
S11. My understanding is improved compared to similar courses I studied before	2.89 (1.27)	2.70 (1.14)	2.93 (1.27)	2.87 (1.28)	0.743
S12. My performance in exams is improved compared to similar courses I studied before	3.49 (1.22)	2.75*** (1.18)	3.65 (1.21)	3.43 (1.22)	0.149
S13. I am satisfied with the level of effort this course required.	3.62 (1.06)	3.20** (1.15)	3.79 (1.07)	3.55 (1.06)	0.085
S14. I am dissatisfied with my performance in this course.	3.34 (1.20)	3.00* (1.31)	3.42 (1.33)	3.31 (1.14)	0.507
S15. I believe I will be satisfied with my final grade in the course.	3.59 (1.05)	3.40 (1.08)	3.74 (1.12)	3.53 (1.02)	0.138
S16. I am satisfied with how I am able to apply what I have learned in this course.	3.45 (1.04)	3.40 (1.18)	3.37 (1.21)	3.48 (0.97)	0.467
S17. Had I known this was a blended learning class, I would not have taken it.	3.91 (1.07)	3.00*** (1.33)	3.82 (1.18)	3.95 (1.02)	0.386
S18. I am willing to take another course using the blended learning delivery mode	3.80 (1.02)	2.55*** (1.29)	3.86 (1.04)	3.78 (1.01)	0.561
S19. I am satisfied enough with this course to recommend it to others.	3.62 (1.11)	2.90*** (1.26)	3.71 (1.20)	3.58 (1.07)	0.385
S20. Compared to face-to-face course settings, I am less satisfied with this learning experience.	2.65 (1.23)	2.50 (1.37)	3.01 (1.28)	2.50** (1.18)	0.002
S21. I enjoy working on assignments by myself.	3.76 (1.01)	3.55 (1.29)	3.75 (1.11)	3.77 (0.96)	0.892
Instructor Domain (S22-S26)					
S22. The instructor makes me feel that I am a true member of the class	3.61 (1.01)	3.70 (1.29)	3.54 (1.10)	3.64 (0.97)	0.438

* $p < 0.050$, ** $p < 0.010$, *** $p < 0.001$

	Nurse sample (n = 283)	CIT 2012 (n = 108)	Nurse Male (n = 84)	Nurse Female (n = 199)	Male/female Nurse comparison
S23. I am dissatisfied with the accessibility and availability of the instructor	3.31 (1.17)	3.00* (1.36)	3.36 (1.20)	3.30 (1.16)	0.694
S24. The instructor uses blended learning technology appropriately.	3.89 (0.95)	4.00 (0.94)	4.12 (0.94)	3.80** (0.94)	0.009
S25. Class assignments were clearly communicated to me.	3.60 (1.16)	3.70 (1.22)	3.46 (1.24)	3.66 (1.12)	0.204
S26. Feedback on evaluation of tests and other assignments was given in a timely manner	3.30 (1.20)	3.70** (1.27)	3.54 (1.20)	3.20* (1.19)	0.031
Management Domain (S27-S29)					
S27. Discipline is highly observed when the lecturer is on the other side of the blended learning	3.78 (1.01)	2.95*** (1.32)	3.82 (1.04)	3.77 (1.00)	0.695
S28. The lecturer/supervisor always takes attendance.	3.54 (1.02)	4.00** (1.39)	3.55 (1.09)	3.54 (0.99)	0.943
S29. I attend discussion board classes the same way I attend face-to-face classes	3.62 (1.27)	3.85 (1.39)	3.46 (1.32)	3.69 (1.25)	0.185
Technology Domain (S30-S35)					
S30. The instructor's voice is audible.	3.66 (1.04)	3.75 (1.28)	3.93 (0.93)	3.55** (1.07)	0.003
S31. Course content shown or displayed on the smart board is clear.	4.10 (0.86)	4.50*** (0.80)	4.10 (0.94)	4.10 (0.83)	0.998
S32. The microphone is in good working condition.	3.78 (1.06)	3.60 (1.31)	4.14 (0.89)	3.62*** (1.09)	< 0.001
S33. The image is clear and comprehensive when the lecturer is on the other side of the blended learning classroom.	3.94 (0.90)	3.90 (1.27)	4.04 (0.86)	3.89 (0.92)	0.215
S34. Technical problems are not frequent and they do not adversely affect my understanding of the course.	3.13 (1.30)	3.65*** (1.21)	3.54 (1.19)	2.97*** (1.31)	< 0.001

* $p < 0.050$, ** $p < 0.010$, *** $p < 0.001$

	Nurse sample (n = 283)	CIT 2012 (n = 108)	Nurse Male (n = 84)	Nurse Female (n = 199)	Male/female Nurse comparison
S35. The technology used for blended teaching is reliable	3.88 (0.91)	3.60* (1.11)	4.00 (0.93)	3.83 (0.90)	0.167
* $p < 0.050$, ** $p < 0.010$, *** $p < 0.001$					

Interaction domain: The main finding from Table 1 is that male and female nursing students report similar levels of satisfaction in the Interaction domain with the exception that male students are significantly more reluctant to interrupt an instructor during a blended learning session than female students. Mean levels of satisfaction significantly exceeded their CIT comparator in four aspects of instructor-student and student-student interactions and in so doing maintained good continuity of attention throughout remote e-learning sessions leading to the reinforcement of personal feelings of class participation. Otherwise nursing and CIT students had similar attitudes towards potential inhibitions when participating in a mixed gender environment, the importance of consulting instructors during office hours when undertaking blended learning courses and their willingness to interrupt instructors during e-learning sessions. In conclusion, satisfaction in the interaction domain was significantly above average for nursing students, and also significantly better than that of their CIT counterparts ($p < 0.001$).

Instruction domain: Nursing students most highly rated not being ‘put off’ before undertaking the blended learning course nor for participating in future courses, and also enjoyed undertaking assignments using this method. Male and female responses were similar in all the statements of this domain with the exception that female responses were significantly lower than those for males when comparing blended e-learning and face-to-face instruction. Male students took a neutral position whereas female students had a significant preference for the blended learning environment. Interestingly, male students were largely neutral in their comparison of blended e-learning and face-to-face instruction whereas female students mildly preferred blended e-learning over face-to-face instruction ($p = 0.002$).

By comparison with their CIT counterparts, nursing students showed significantly increased levels of satisfaction in 7 of the 12 facets of the instruction domain including their willingness to recommend their blended learning course to others and to participate in future courses involving blended learning, their belief that blended learning improves their motivation to learn independently and that the level of effort required of such a course will be reflect in improved examination performance by comparison with similar courses taken previously. In the remaining facets of the Instruction domain both cohorts of students had similar levels of satisfaction and beliefs. For example, each cohort positively enjoyed working independently on assignments, held positive beliefs that they will be satisfied with their final grades and with their ability to apply what has been learned. Interestingly, both cohorts refuted the notion that blended learning was inferior to face-to-face instruction. In overview, satisfaction in the instruction

domain was significantly above average for nursing students, and also significantly better than that for their CIT counterparts ($p < 0.001$).

Instructor domain: Nursing students expressed good satisfaction with the way that course instructors created a class atmosphere, made appropriate use of technology, clearly communicated assignments and provided timely feedback. Male and female students responded similarly but the latter were significantly less satisfied than their male counterparts with the appropriateness with which instructors used blended learning technology and their timeliness of feedback. Nevertheless, female students were still moderately satisfied with instructors' performance.

While the nursing and CIT students reported similar levels of satisfaction with the clarity of the communication of class assignments, use of blended learning and inclusiveness generated by instructors, it is clear that CIT students rated the timeliness of feedback and instructor availability significantly higher that their nursing counterparts who thought that instructors could have provided greater accessibility and availability than the current provision. Consequently, CIT students satisfaction with their instructors was significantly higher than that of nursing students ($p = 0.030$), although satisfaction was significantly better than average for the latter.

Management: Male and female nursing students were similarly well satisfied with the administrative aspects of blended learning courses, and in particular the positive acceptance of the need for discipline in the remote e-learning environment. Overall there was no significant difference between the nursing and CIT students in this domain ($p = 0.717$), although the latter viewed discipline as significantly less important than the former, but this facet was counterbalanced by CIT instructors being significantly more rigorous than their nursing faculty counterparts in recording attendance at e-learning sessions.

Technology: While nursing students were, on average, positively satisfied with all aspects of the Technology domain, the most notable feature of the responses in this domain was that female satisfaction was lower than that of males in 5 of the 6 facets of the domain, and demonstrated significantly less satisfaction with respect to the audibility of instructors' voices, the operability of instructors' microphones and the impact of adverse technical issues on the effectiveness of the remote e-learning session. Nevertheless, female students never rated these issues lower than neutral indicating an overall level of mild satisfaction.

On average, nursing students were less satisfied than their CIT counterparts in respect of the disruption caused by technical issues and the use of the smart notice board, but were better satisfied with how technology was used in their blended e-learning program. In overview, however, levels of satisfaction in the Technology domain for nursing and CIT student were similar ($p = 0.717$).

Analysis of domain responses

Questionnaire responses were further collated according to the five domains of satisfaction. The frequencies of responses are illustrated in Fig. 2.

Almost two-thirds (60%-65%) of respondents agreed or strongly agreed that they were satisfied with all five components of education being investigated by the questionnaire topics, approximately (15–20%) had a neutral response and less that one fifth (15–20%) disagreed or strongly disagreed. These responses demonstrate consistency in the students' levels of satisfaction within each domain of the education context and across each of the domain. The mean domain responses are reported and compared in Table 2 by year of undergraduate study.

Title: Mean domain satisfaction responses are presented by undergraduate year of study.

Table 2
Mean and standard deviations of domain satisfaction responses are reported for nursing students by undergraduate year of study. Satisfaction levels between year groups are compared.

Domain	**Undergraduate year of study**			**Inter-year comparisons of mean scores**		
	Year 2 N = 90 mean (SD)	**Year 3 N = 103 mean (SD)**	**Year 4 N = 90 mean (SD)**	**Years 2 & 3 p-value**	**Years 2 & 4 p-value**	**Years 3 & 4 p-value**
Interaction	3.56 (1.12)	3.48 (1.05)	3.58 (1.14)	0.174	0.660	0.069
Instruction	3.40 (1.25)	3.44 (1.14)	3.65 (1.13)	0.370	< 0.001	< 0.001
Instructor	3.42 (1.20)	3.52 (1.10)	3.69 (1.04)	0.189	< 0.001	0.015
Management	3.64 (1.13)	3.63 (1.10)	3.68 (1.11)	0.889	0.672	0.560
Technology	3.67 (1.07)	3.67 (1.04)	3.92 (1.07)	0.905	< 0.001	< 0.001

The most significant finding in Table 2 is that 4th year undergraduate students have the highest mean scores in all five domains. Despite this result, the mean satisfaction scores in the domains of Interaction and Management are similar for years 2, 3 and 4. Second, the mean domain scores between 2nd and 3rd year students are similar in the remaining domains, and consequently students in their 2nd and 3rd years of study report similar levels of satisfaction across all the domains of enquiry. However, satisfaction levels of 4th year students in the domains of Instruction, Instructor and Technology are significantly higher than those of 2nd and 3rd year students ($p \leq 0.015$).

A similar investigation of satisfaction ratings within individual year groups was conducted. Pairs of mean domain scores (n = 10 per year group) were compared within each year group. Rather that report detailed comparisons, we summarise the findings. Students in their 2nd year of study provided similar overall satisfaction ratings for the Interaction and Management domains ($p = 0.281$), the Instruction and Instructor domains ($p = 0.670$) and the Management and Technology domains ($p = 0.686$). All other comparisons of mean domain satisfaction scores were significantly different.

Students in their 3rd year of study assigned similar levels of satisfaction to the Interaction, Instruction and Instructor domains with p-values ranging from $p = 0.159$ to $p = 0.523$, but these scores were

statistically significantly lower than satisfaction scores for the Management and Technology domains which were similarly rated (p = 0.606). Again, all other comparisons of mean domain satisfaction scores were significantly different.

Finally, students in their 4th year of study assigned similar satisfaction ratings to the Interaction, Instruction, Instructor and Course Management domains with p-values ranging from p = 0.080 to p = 0.908, but these domains all received satisfaction scores significantly lower than that for the Technology domain.

Reliability of data

The reliabilities of the five domains of the student questionnaire were tested using Cronbach's alpha measure. The results of these calculations are shown in Table 3.

Table 3
Mean nursing and CIT domain satisfaction responses are compared. Cronbach α measures and their 95% confidence bounds are shown for each domain of the nursing and CIT (brackets) survey questionnaires.

Domains of enquiry	**Comparison of Nurse and CIT mean domain scores and associated p-value**			**Cronbach α**	**95% confidence bounds for Cronbach α reliability**	
	Nurse mean (SD)	**CIT mean (SD)**	**p-value**	**Nurse (CIT)**	**Lower Nurse/(CIT)**	**Upper Nurse/(CIT)**
Interaction (9 items)	3.54 (1.10)	3.10 (1.24)	**< 0.001**	0.682 (0.750)	0.617 (0.650)	0.725 (0.800)
Instruction (12 items)	3.49 (1.18)	3.00 (1.23)	**< 0.001**	0.864 (0.840)	0.834 (0.770)	0.886 (0.914)
Instructor (5 items)	3.54 (1.12)	3.80 (1.23)	**0.030**	0.720 (0.700)	0.656 (0.590)	0.763 (0.780)
Management (3 items)	3.65 (1.11)	3.60 (1.35)	0.717	0.534 (0.570)	0.415 (0.400)	0.633 (0.694)
Technology (6 items)	3.75 (1.07)	3.70 (1.18)	0.677	0.772 (0.800)	0.724 (0.710)	0.809 (0.840)
All domains (35 items)	3.37 (1.24)	3.31 (1.23)	0.667	0.906	0.888	0.918

The overall reliability of the questionnaire was rated in excess of 90%, which is excellent. Reliabilities of 86.4%, 77.2% and 72.0% in the Instruction, Technology and Instructor domains respectively are rated as good whereas a reliability rating of 68.2% in the Interaction domain is rated as acceptable (Cronbach alpha reliability descriptor https://stats.stackexchange.com/questions/70274/where-do-the-descriptors-

for-cronbachs-alpha-values-come-from-e-g-poor-exce). Only the domain of Management falls below 60.0%, the minimum reliability rating of acceptability. All nursing indices fall within the 95% confidence intervals of the equivalent CIT index (in brackets) which suggests that the nursing and CIT questionnaires have similar (and good) levels of reliability.

Discussion

The purpose of this paper is to investigate and report student satisfaction ratings for a new and immediate transition into an e-learning domain of a blended curriculum in the wake of Covid-19 protection initiatives at Umm Al-Qura University. Using a previously validated student e-learning questionnaire, student satisfaction levels across five domains of an education setting- instructor, instruction, interaction, course management and technology were found to be strongly endorsed (Table 2).

Quality of interaction with their lecturer, other students and satisfaction with their class participation and with all parties was high. Students rated their ability to remain alert and focussed above average despite the ‘barrier’ of the virtual classroom situation (Table 1). There was general agreement in responses by males and females except that male students were significantly more reluctant to interrupt an instructor.

Learner satisfaction is one of the key factors for the success of the programs. Mahmood et al. [8] argue that teaching presence is a critical factor in determining how students evaluate online learning. In a similar vein, Kuo et al. [9] argue that student-student and student-teacher interactions are important for successful face-to-face and online learning modalities. Indeed, many studies have found that student satisfaction is strongly correlated with the quantity and quality of student interactions in almost all learning environments.

In the instruction domain the nursing students demonstrated good satisfaction with high scores for self motivation, not being ‘put off’ by knowing the course would have an e-learning component and willingness to take further e-learning courses. They also believed that their efforts would be rewarded by improved examination performance by comparison with similar courses undertaken, and would be prepared to recommend blended learning courses to others (Table 1).

Students also showed good satisfaction in the Instructor domain, but here female students were noticeably less satisfied with the instructors’ use of technology and the speed of feedback on submitted work for evaluation than males (Table 1). Male and female students reported similarly on the management domain. Importantly, nursing students rated highly adherence to online discipline (Table 1). The importance of known structures in education provision and acceptable behaviours is highlighted as one of the key concepts in student satisfaction by other educationalists [10].

Levels of satisfaction within the technology domain of the new learning environment were rated highest when compared to all the other domains within the questionnaire, particularly for final year undergraduate students (Table 2). Highly scored components were the clarity of images and content and

reliability of the technology. Female student satisfaction, however, was rated lower in technological aspects of the education delivery as opposed to content, but never fell below a neutral stance.

Differences in satisfaction rates across domains of education were then examined across the years of the curriculum (2nd – 4th years). The mean scores for satisfaction were significantly above the mean for all domains of satisfaction and even more so by the time the students reached fourth year (Table 2). This may be associated with a more diverse learning experience included e-learning and increased maturity that has generated more capacity and capability to adapt to change. Comparisons of mean nursing domain scores with the equivalent CIT domain showed that nursing satisfaction ratings were significantly higher in the domains of Interaction and Instruction ($p < 0.001$), similar in the domains of Management ($p = 0.717$) and Technology ($p = 0.667$) but were significantly lower in the Instructor domain ($p = 0.030$) (Table 3) .

The reliability of the entire questionnaire exceeded 90% which is excellent as measured by Cronbach's alpha index. At a domain by domain level, the reliabilities of the nursing and CIT domains were similar with only the Management domain in both surveys falling below the acceptable level of 60% probably due to the small number of items in that domain (Table 3).

The changes to the curriculum that have been undertaken at Umm Al-Qura University in light of the Covid-19 dangers are being evaluated to ensure that they are effective, an important dimension of which is student satisfaction. The literature shows the most promising trends in the development of blended learning to be unbundling academic programs and curricula in local institutions and implementing strategies to respond to the accelerated and diverse change in technologies, such as bring your own device (BYOD) [11, 12]. Blended e-learning was undertaken in order to move swiftly from a traditional classroom education to that of a new e-learning approach within a blended curriculum design. It is interesting to note that students were able to utilise acquired skills in technology through other uses like social media to participate and interact in the new learning environment. This nascent talent within the undergraduate nursing students made it possible to proceed instantly to a remote (as opposed to distance) e-learning structure without formal training programs, but with the support of the Deanship of e-learning and academic staff who were themselves learning new skills.

Some still associate the computer culture and internet with gender differences, pointing out that males and females do not use technology the same way, or at the same level of experience. It is assumed that men are more likely than women to use online media and show a higher level of proficiency with computers [12]. Few differences exist between how male and female students use e-learning and their motivation and satisfaction in this survey. Nevertheless, neither gender roles nor technology behave as stable entities [13]. Current evidence suggests that men and women display varying degrees of anxiety, acceptance and interest in new technologies over time, but that access and training has contributed to a progressive narrowing of the gender gap [14, 15]. Women, however, are more inclined than men to perceive computers as instruments of social media, and as such tend to prefer communicative activities. The development of web 2.0 with its focus on communication and social tools has thus increased female

internet usage, which in turn has a significant impact on e-learning scenarios [16]. In this context, men tend to give longer and more frequent statements while women show more openness for other's proposals and more willingness to cooperate. Consequently, women tend to prefer group working while men are more likely to solve problems on their own [17]. However comparing male and female responses showed only a few statistically significant differences within this evaluation. Males were more likely to hesitate to interrupt the lecturer, preferred face-to-face instruction (Table 1), but rated the instructor use of technology well (Table 2) compared to females. Males gave higher rating on audibility, timeliness of feedback and were less critical of technical difficulties than females (Table 1).

The topic of learner satisfaction has received significant attention. Ke and Kwak [17] identified learner relevance, active learning, authentic learning, learner autonomy and technological competence as key factors underlying learner satisfaction. Kuo et al. [9] found that positive student satisfaction is strongly correlated with efficiently functioning technology in combination with the effective engagement of students with instructors and course content. Using a criterion approach, Battalio [18] argued that positive course satisfaction requires effective learner-instructor interaction. Dziuban et al. [19] found that an enriched learning environment, well-defined rules of engagement, instructor commitment, reduced ambiguity, an engaging environment and reduced ambivalence about the value of the course are key components of learner satisfaction defining learner satisfaction with their learning context. Our new learning environment was rated above average for satisfaction with the package of learning tools employed i.e. Blackboard, WhatsApp, digital enablement, interface devices and e-learning support. These finding are supported by other investigators. In previous research students' expectations of the effectiveness of technology tools in online courses were found to be critical to understanding the concept of satisfaction in online education. They further reported that satisfaction was most impacted by learning convenience combined with the effectiveness of e-learning tools [20]. Such perspectives were explored within the student satisfaction enquiry in this study and were found to be positively rated and therefore an endorsement that this new e-learning environment indeed supports learning and satisfaction.

In overview, nursing student responses indicate that they are attentive to the contents of the remote e-learning sessions, recognise the importance of attending and participating in the blended learning process with the same level of diligence as they would in a face-to-face learning scenario.

Conclusions

Overall the undergraduate nursing students surveyed in this study reported positive levels of satisfaction with their education experiences in the fast transition to remote e-leaning within a blended undergraduate nursing curriculum. The results demonstrate that they coped with the immediate implementation of a new dimension to their learning, demonstrated agility, resilience and fortitude in adapting to the new e-learning blended curriculum while coping with the stress of the ongoing pandemic. The evaluation of their satisfaction with this new learning environment was conducted across five areas- instructor, instruction, interaction, course management and technology. Overall above average satisfaction with the new course delivery was reported across all five domains of education. Such detailed and formal

satisfaction feedback on course changes provides important insights relating to the structural and process components of education and their engagement reaching beyond standard student end of course surveys.

Limitations

The satisfaction questionnaire was developed with students who were undergraduates in information technology classes and who may be more IT literate than the students of this study. This may in turn introduce an element of bias in responses to some questions. However, the tool was still relevant to the nursing students in the study and analyses of reliability showed good agreement with the reliability of the CIT study [6]. The number of questions in each domain varied and it is not clear that sufficient areas of exploration were included in some of the domains to sufficiently represent the construct, e.g. management had only three questions. However, it is important to recognise that keeping the number of questions to a minimum is necessary to lessen the risk of responder fatigue.

The negative wording of some of the questions and the reverse scoring needed careful interpretation as the format was that of the 'double negative'. It cannot be taken for granted that the respondents correctly interpreted questions framed in this manner. However, this comment applied only to (20%) of questions.

Recommendations

Education providers should take some message of encouragement and confidence in enacting agile practices to meet the needs of the students and staff in dealing with unprecedented disruption to practice. Multi-system action and intervention have been traced to the end-user and shown to be collectively powerful endorsements for the re-design of their learning and assessment processes and context.

Declarations

Ethics approval and consent to participate: The study was conducted in accordance with the methods and procedures for human research [7]. Ethical approval was granted by the Research Ethic Committee of the Faculty of Nursing.

Consent for publication: Not applicable

Availability of data and materials: The datasets used and/or analysed in this study are currently available from the authors on reasonable request. The process of making the data downloadable is underway and we would welcome further scientific contributions based on this data.

Competing interests: The authors have no competing interests.

Funding: Not applicable

Authors' contributions: The authors NT and GML conceived the project and collected the data. The authors HIA and PR analysed the data and prepared a preliminary interpretation of the findings from the data. The authors FA, MSA, SAA and HYSA wrote the first draft of the manuscript. Authors NT and GML refined this first draft into the preliminary manuscript. All authors taught the blended e-learning program, and reviewed and contributed to the final submitted manuscript.

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Figures

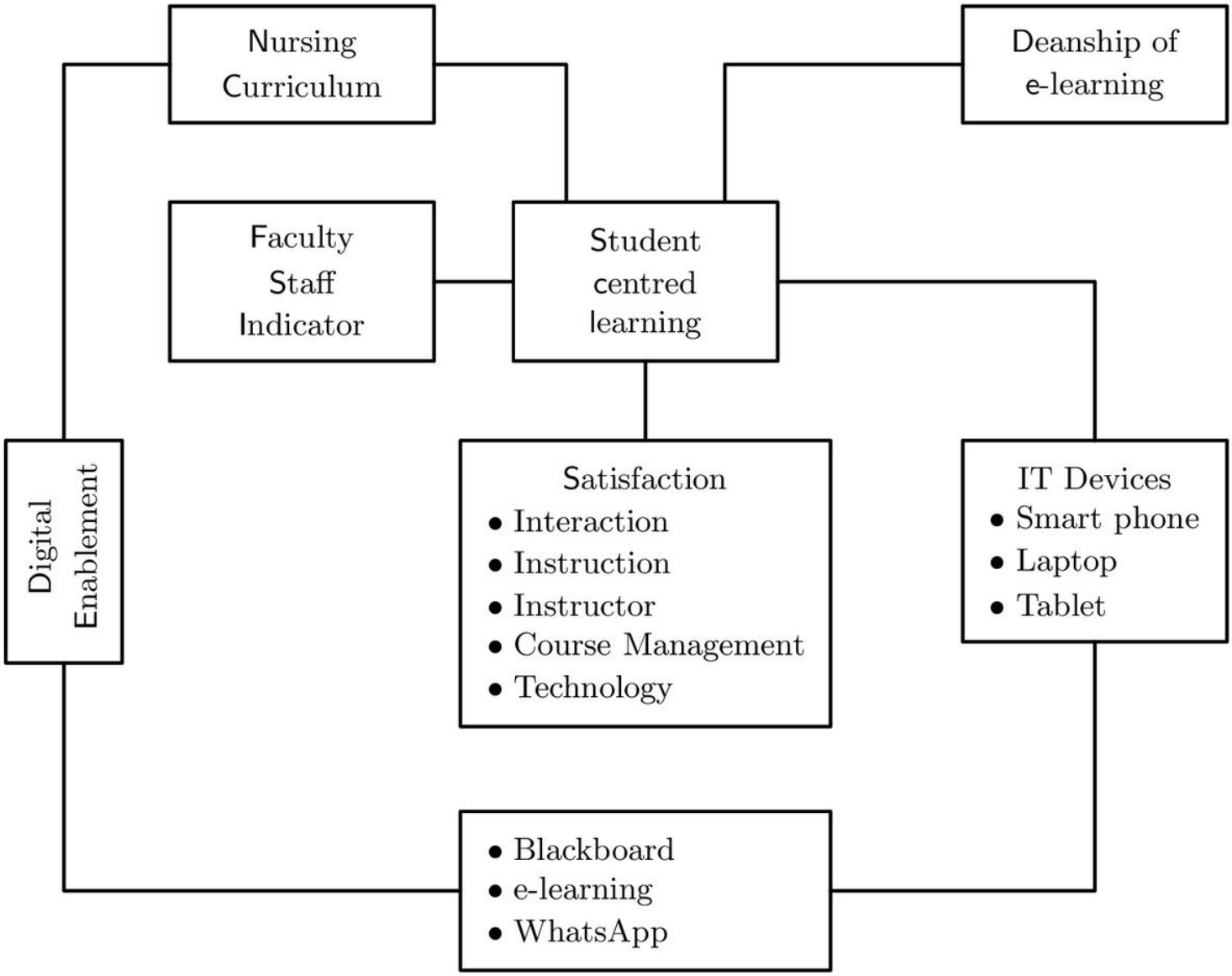

Figure 1

Components of the blended nurse education and training environment are illustrated. Schematic diagram illustrating the various components of the blended teaching environment in the context of nurse education and training

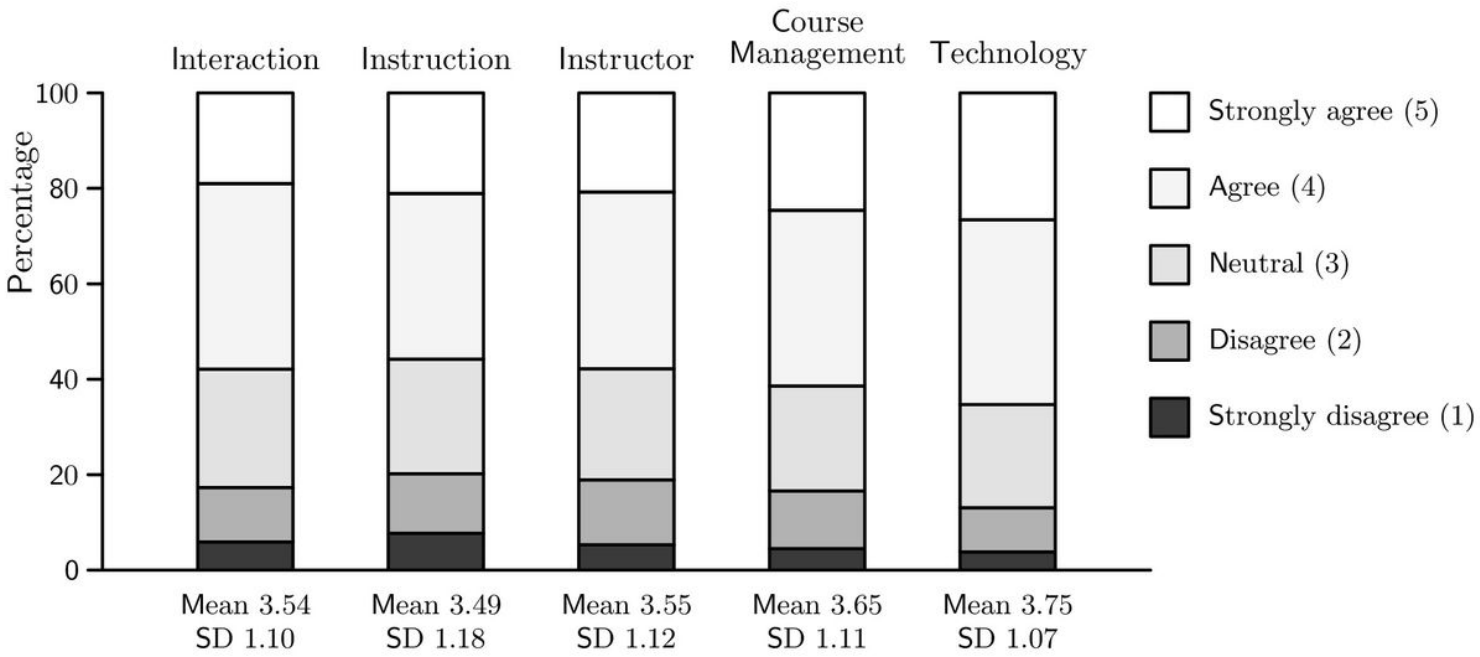

Figure 2

Histogram of percentages of responses within each satisfaction domain of enquiry. A histogram of the percentages of responses from 1 to 5 within each domain of education. The mean satisfaction response for each domain is shown together with its standard deviation.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Table1.docx
- Table3.docx
- Table2.docx
- Questionnaire.docx