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Jordanian nursing students' engagement and satisfaction with e-learning during COVID-19 pandemic

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Abstract

Background: Nursing education was affected by the COVID-19 pandemic as most institutions shifted to e-learning. The aim of the current study was to examine students' engagement and satisfaction levels with e-learning during the COVID-19 pandemic.

Methods: A descriptive correlation design was used to guide this study. A voluntary response sampling method was used to recruit undergraduate nursing programs in Jordan. Data were collected using an electronic link to a self-reported questionnaire.

Results: A total of 1,562 undergraduate nursing students responded to the questionnaire. The study showed that most students have high engagement in the emotional, skills, and performance subscales and low engagement in the participation subscale. Further, they were moderately satisfied with e-learning during the COVID-19 pandemic.

Conclusions: Students identified several issues regarding their e-learning, which must be considered to improve their engagement and satisfaction. Further, the study revealed several shortcomings in preparing students to attend e-learning classes.

Keywords: COVID-19; e-learning; education outcomes; nursing students; students engagement; students satisfaction.

Introduction

Pandemics drive countries to have proactive plans to find an alternative to the traditional education system (Uscher-Pines et al., 2018). During communicable disease outbreaks, social distancing is recommended to stop the infection cycle by increasing the space between people and decreasing the frequency of contact (Hensley, 2020). Since the spread of COVID-19, more than 300 million students worldwide have had their education interrupted (UNESCO, 2020), which forced higher education institutions to replace traditional classroom activities with online lectures to prevent the interruption of students' learning. E-learning relies on utilizing technology in the educational process to help learners and teachers overcome geographical barriers and maintain the excellence of the learning experience worldwide (Quail et al., 2016).

In response to the COVID-19 pandemic, the Jordanian government and stakeholders, including the head of ministries, the ministry of higher education, and the ministry of health, worked together to guide the implementation of e-learning programs that aim to maintain the education continuum. On March 15, 2020, all face-to-face academic activities were suspended, and e-learning emerged as a possible solution to preserve education

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continuity during educational institutions' closure resulting from the COVID-19 pandemic (Al-Balas et al., 2020). As a result, an average of 7,000 undergraduate nursing students across Jordanian universities shifted to e-learning.

This sudden shift may negatively impact students, their families, teachers, and faculty members (UNESCO, 2020). For instance, some students readily adapted to this shift; they might be satisfied and happy with its flexibility, whereas others experienced discomfort because of inadequate skills or less engagement with new technology (Carolan et al., 2020). Hence, another critical issue comprises the central gap in the current situation, which is our knowledge about the factors that affect nursing students' engagement and satisfaction levels.

There has been an increased reliance on using technologies during the COVID-19 outbreak. In order to connect, entertain, and gather knowledge, people worldwide depend heavily on online platforms. Similarly, online technology is now used by the education system to conduct learning practices (Alhumaid et al., 2020). Some studies that were conducted to assess the effectiveness and obstacles to using e-learning during the COVID-19 pandemic revealed that students viewed e-learning as a good opportunity to continue their education. Others reported the obstacles that interfere with e-learning education, such as lack of previous experience in using online tools, lack of technical management support, and poor internet disconnection (Diab & Elgahsh, 2020; Muflih et al., 2020; Subedi et al., 2020).

In the same context, previous studies revealed that student engagement and satisfaction using e-learning during the COVID-19 pandemic were highly associated (El-Sayad et al., 2021; Jiang et al., 2021; Natarajan & Joseph, 2022; Orcid et al., 2021). Student engagement with e-learning can be promoted by active interactions of students with their classmates, instructors, as well as the content. These interactions were the main reasons for explaining learners' satisfaction. On the other hand, students who were more engaged were more likely to spend more time learning, participate more, and keep looking for new strategies to boost learning (Sinval et al., 2021). It is worth mentioning that student satisfaction with e-learning can also be linked to many other factors such as quality of the course, perceived ease of use and usefulness of online platform, method of evaluation, prior experience, self-efficacy of the computer and new technology, and perceived learning (Bayrak et al., 2020; Jiang et al., 2021).

Generally, despite the previous studies that examined e-learning in Jordan (Al-Balas et al., 2020; Aljaraideh & Al Bataineh, 2019; Muflih et al., 2020; Nabolsi et al., 2021; Suliman et al., 2021), the education outcomes and factors that may affect nursing e-learning from students' perspectives have not been investigated, especially at the national level. The insufficient evidence on the e-learning outcomes, especially during the current urgent use due to the COVID-19 pandemic, necessitates conducting a national study to help stakeholders improve the current practices and the learning experience of nursing students. Especially since several institutions adopted online learning in some courses even after returning to face-to-face education, a national study to explore students' perspectives on e-learning was imperative. Therefore, this study is the first of its kind in the region to examine the relationship between nursing students' engagement and satisfaction levels during e-learning in Jordan during the COVID-19 pandemic.

The current study added to the body of knowledge regarding e-learning by identifying different factors that affect students' learning experiences and education outcomes. The study results may help policymakers at higher education institutions and educators to make informed decisions to improve e-learning programs and support the students' needs. Additionally, the current study provided baseline data that can guide future research studies.

This study is based on the Constructivist Learning Theory, which was described as a learning theory for the digital age; it can be traced back to the work of Jean Piaget (1896–1980). Constructivist Learning Theory focuses on individuals who are actively engaged in their own learning; therefore, educators who apply constructivism need to develop student-centered teaching strategies (Billings & Halstead, 2012). E-learning's features are drawn from the constructivist learning paradigm; the fundamental assumption is that information is created instead of being passed from the teacher to the students (Piaget, 1983; Vygotsky, 1978).

In this strategy, the instructor ensures that students recognize and discuss pre-existing conceptions and then expand them; On the other hand, students need to become self-regulated and active learners rather than passive throughout the independent exploration process (Oliver, 2000). For instance, active learning and interaction mean that learners need to feel like they are dealing with actual people, that they contribute to their peers, and that they are engaging in communication, discussions, negotiations, arguing, and taking other points of view (Ally, 2008; Wang et al., 2009). In the same assertion, Swan (2001) identified interaction with instructors, dynamic

interaction with peers, and transparent interface as factors associated with successful course design to achieve learning objectives and enhance satisfaction.

The purposes of this study were to (1) examine the engagement and satisfaction levels with e-learning among undergraduate nursing students during the COVID-19 pandemic and (2) examine the relationship between engagement and satisfaction levels among undergraduate nursing students during the COVID-19 pandemic. The current study answered the following research questions:

- (1) What are the levels of engagement and satisfaction with using e-learning among Jordanian undergraduate nursing students during the COVID-19 pandemic?
- (2) Which demographic variables contribute to undergraduate nursing students' engagement and satisfaction with using e-learning during the COVID-19 pandemic?
- (3) What is the relationship between engagement and satisfaction with using e-learning among Jordanian undergraduate nursing students during the COVID-19 pandemic?

Methods

Research design

A descriptive correlation design was used to guide this study.

The setting, population, and sample: This national study targeted all nursing students enrolled in undergraduate nursing programs in all nursing schools in Jordan. These nursing schools include one military, seven governmental, and eight private schools. These schools were located in different geographical regions: seven in the Middle region, three in the South region, and five in the North region. The total number of students varies in each school; a higher number of nursing students were enrolled in governmental universities.

We targeted to recruit the entire population (a national study). Sampling was performed using the voluntary response sampling method (Murairwa, 2015); the researcher accessed the nursing schools and asked for a list of eligible students' names and emails. Then, the researcher sent the questionnaire to them. The calculated total number of nursing students (excluding the first-year nursing students) across nursing schools was 5,134. In the current study, data collection took place from March 2021 to June 2021. A link was sent to all schools targeting all students; of these, 1,562 students responded (a response rate of 30.4%).

Inclusion and exclusion criteria: The participants were selected from nursing schools that deliver e-learning courses to bachelor's degree students. Eligibility criteria were: (1) a Jordanian nursing student enrolled in a bachelor's degree program, (2) the student is registered for e-learning courses during the data collection period, (3) the student is in second, third, or fourth-year levels, and (4) participants must be able to use computers and were willing to participate in the study. Exclusion criteria were: (1) first-year students because they lack sufficient experience in e-learning, (2) those who did not attend e-learning courses during previous semesters, and (3) non-Jordanian students. These students were excluded to ensure that all the participants had the same experience of using e-learning before the data collection period.

Ethical considerations: The proposal of this study was submitted to the Institutional Review Board (IRB) at the School of Nursing/ University of Jordan for approval (Reference No. 94/2021/1). Approvals from the original authors to use and translate the questionnaires were also obtained. After that, ethical approvals from the data collection sites were obtained. The researcher informed the students about the study's purpose and research process, then reminded them of their right to participate/refuse and withdraw from the study at any time. Participants were assured that their choice to participate would not affect their grades and that participation in the study is free from any risks or compensation. To protect participant confidentiality, the data were linked to the investigator's personal account; therefore, no one accessed the data. Also, results were stored anonymously in a password-locked computer that only the principal investigator accessed. The participants were notified that their acceptance to answer the questionnaire and return it to the researcher was considered their informed consent to participate.

Data collection: The investigator contacted a liaison person in each school and sent the invitation letters through an electronic link to their emails, to be forwarded to the students through the school website or their personal phones via the WhatsApp groups. The investigator collected the data using an electronic survey application (Google Documents), which was linked to a personal account of the investigator. Although using online surveys have limitations, researchers proposed several strategies to ensure the quality of the data (Ball, 2019; Chang & Vowles, 2013; Eysenbach, 2004). These strategies were used while conducting the current study to check the validity of responses, such as distributing the link to a liaison person in each university to deliver it to their students, sample population

specification, removal of invalid responses (screened individually to remove questionable responses), and removal of inconsistent responses (responses for selected pairs of questions, which were supposed to be similar or dissimilar). Finally, all questions were set as mandatory to avoid missing data.

Instruments: The questionnaire comprised two main parts: the first one is the demographic data sheet prepared by the researcher of the current study, and the second part was composed of two instruments to measure the study variables. The approvals to use the instruments were taken from the authors, and then they were translated into Arabic according to WHO guidelines. The data collection instruments are explained in detail in the following section.

Online student engagement scale: A translated version (to Arabic) of the Online Student Engagement Scale (OSE) (Dixon, 2015) was used. The OSE measures the students' engagement comprises 19 items measuring four subscales (emotional, skills, participation, and performance), where the participants responded on a 5-items Likert scale ranging from one (not at all characteristic of me) to five (very characteristic of me). The lowest possible score was 19, and the highest was 95. Then, the mean score for each subscale was calculated. According to Dixon (2010), scores above 3.4 represent high engagement, while scores equal to or less than 3.4 represent low engagement. The instrument showed strong reliability (Cronbach's $\alpha=0.91$) (Dixon, 2015). Cronbach's α in the current study was 0.942.

The satisfaction scale: A translated version (to Arabic) of the Satisfaction Scale (Kuo et al., 2013) was used to measure students' satisfaction with online learning. The scale comprises of five items, where participants responded on a 5-items Likert scale ranging from one (strongly disagree) to five (strongly agree). The lowest possible score was five and the highest was 25. Then, the mean score for each item was calculated. The five-point Likert scale was categorized into three groups (low, moderate, and high). The group interval value was calculated according to the formula: $[\text{highest possible mean score} - \text{the lowest possible mean score}/\text{groups}] = [(5 - 1)/3] = 1.33$ (Polit & Hungler, 1991). So, the scale levels can be described as low (1.00–2.33), moderate (2.34–3.67), and high (3.68–5.00). The instrument showed strong reliability (Cronbach's $\alpha=0.89-0.93$) (Kuo et al., 2013). Cronbach's α in the current study was 0.949.

Translation and validation of the scales: Before data collection, the questionnaires were translated into Arabic following the WHO guidelines for translation (WHO, 2005). The scales were forward translated to Arabic by two bilingual experts; the first translator was a Jordanian English teacher who holds a Master's degree in English, and the second translator was a Jordanian Ph.D. candidate nurse in the USA. After translating to Arabic (forward translation), a Master's degree holder expert nurse educator who lived three years in England compared the two translations regarding clarity and consistency in the meanings of words, sentences, and phrases. Modifications were made based on his suggestions. Then the scales were back-translated to English by a bilingual professor in the USA, then checked by the expert nurse (the Jordanian Ph.D. candidate in the USA). The final version of the translation was accepted after solving any ambiguity, inconsistency, and clarity (Sousa & Rojjanasrirat, 2011).

Then, face validity was checked; the multi-rater agreement was 55% (Kappa value=0.55, $p<0.000$), acceptable values are above 0.4 (Shafie et al., 2020). Further, pilot testing using 30 students who meet the eligibility criteria was done (Johanson & Brooks, 2010). Generally, students required 15–20 min to fill out the questionnaire.

Data analysis

Statistical analysis was performed utilizing IBM SPSS version 26. The first step in data analysis was to clean and prepare the data. All questions were set as mandatory to be answered; therefore, there was no missing data. Regarding the normality tests, the results might be unreliable for large samples as it detects any minimum deviation from the normal distribution that may not affect the parametric tests results (Ghasemi & Zahediasl, 2012). Therefore, the sample in the current study was assumed to be normally distributed, and parametric tests were used. Descriptive statistics (mean, standard deviation, and frequencies) were used to describe demographic data, the selected scales, and subscales. Comparison of scales' scores among different groups (according to demographics) was conducted using the t -test and ANOVA test. The Pearson r correlation test was used to examine the relation between the continuous variables. The results were considered statistically significant if p value <0.05 .

Results

Participants' demographic characteristics

This study included 1,562 Jordanian participants. Most of them were older than 20 years old ($n=959$, 61.4%). The majority of the participants were female ($n=1,161$, 74.3%) and single ($n=1,377$, 88.2%). Regarding the participants'

Table 1: Participants' demographic characteristics (n=1,562).

| Characteristics | n (%) |
|----------------------------------|--------------|
| Age | |
| ≤20 | 603 (38.6) |
| >20 | 959 (61.4) |
| Gender | |
| Female | 1,161 (74.3) |
| Male | 401 (25.7) |
| Marital status | |
| Single | 1,377 (88.2) |
| Married | 169 (10.8) |
| Divorced | 16 (1) |
| Academic year^a | |
| Second year | 457 (29) |
| Third year | 592 (38) |
| Fourth year | 513 (33) |

^aExcluding 1st year level.

academic characteristics, most of them were in the third academic year, and the average GPA was 80.96 out of 100 (SD ± 9.5, range 48–100). A detailed summary of the participant's demographic characteristics is shown in Table 1.

Nursing program characteristics

Regarding the participants' academic characteristics, the highest percentage of participants were from governmental schools (n=857, 55%), followed by private schools (n=634, 40.5%), and lastly from the military school (n=71, 4.5%). All participants were recruited from second to fourth-year levels. Most of them reported attending both theoretical and clinical courses (n=1,412, 90.4%), while only 8 (0.5%) attended only clinical courses and 142 (9.1%) attended only theoretical courses. The platform used to deliver the e-learning sessions varied from one school to another, some schools used more than one platform; the most dominantly used platform was Microsoft teams (n=1,310, 83.9%), followed by the university's e-learning site (n=766, 49%), Zoom (n=741, 47.4%), and others (n=695, 44.4%).

Students' engagement levels with e-learning during the COVID-19 pandemic

In the current study, the mean score for the total OSE scale was 3.6 (SD=0.83, range=1–5), reflecting that students were highly engaged in e-learning. More specifically, of the 1,562 participants, 41.9% showed low engagement, and 58.1% were highly engaged. The mean scores for the engagement subscales were also calculated. They showed that the participants have high engagement in the emotional subscale (M=3.89 ± 0.89, range=1–5), skills subscale (M=3.64 ± 0.94, range=1–5), performance subscale (M=3.64 ± 1.03, range=1–5), and low engagement in the participation subscale (M=3.35 ± 1.04, range=1–5). A detailed summary of the participant's responses to the OSE scale (Engagement) is shown in Table 2.

Students' satisfaction levels with e-learning during the COVID-19 pandemic

Of the 1,562 participants in the current study, 49.2% showed low satisfaction, 28.2% were moderately satisfied, and 22.6% were highly satisfied. In terms of item-specific analysis, as shown in Table 3, the participants were mostly satisfied with the courses' contribution to their educational development (item 2) (M=2.81 ± 1.37). In contrast, they were least satisfied with the courses' contribution to their professional development (item 3) (M=2.45 ± 1.37).

Table 2: Means and standard deviations of the participants' responses to the OSE scale (engagement).

| Item | | Mean | SD |
|-------------------------------|---|-------------|-------------|
| Emotion subscale | | 3.89 | 0.89 |
| 1. | Putting forth effort | 4.01 | 1.04 |
| 2. | Finding ways to make the course material relevant to my life | 3.84 | 1.11 |
| 3. | Applying course material to my life | 3.60 | 1.19 |
| 4. | Finding ways to make the course interesting to me | 3.78 | 1.13 |
| 5. | Really desiring to learn the material | 4.22 | 1.01 |
| Skills subscale | | 3.64 | 0.94 |
| 6. | Making sure to study on a regular basis | 3.44 | 1.16 |
| 7. | Staying up on the readings | 3.41 | 1.19 |
| 8. | Looking over class notes between getting online to make sure I understand the material | 4.10 | 1.06 |
| 9. | Being organized | 3.47 | 1.20 |
| 10. | Taking good notes over readings, PowerPoints, or video lectures | 3.75 | 1.20 |
| 11. | Listening/reading carefully | 3.70 | 1.15 |
| Participation subscale | | 3.35 | 1.04 |
| 12. | Having fun in online chats, discussions, or via email with the instructor or other students | 3.35 | 1.33 |
| 13. | Participating actively in small-group discussion forums | 3.43 | 1.26 |
| 14. | Engaging in conversations online (chat, discussions, email) | 3.26 | 1.31 |
| 15. | Helping fellow students | 3.82 | 1.13 |
| 16. | Posting in the discussion forum regularly | 3.09 | 1.33 |
| 17. | Getting to know other students in the class | 3.17 | 1.42 |
| Performance subscale | | 3.64 | 1.03 |
| 18. | Getting a good grade | 3.66 | 1.07 |
| 19. | Doing well on the tests/quizzes | 3.62 | 1.09 |

Bold values represent the subscale results.

Table 3: Mean and standards deviation according to the participants' responses to the satisfaction scale.

| Item | Mean | SD |
|---|------|------|
| 1. Overall, I am satisfied with this class. | 2.70 | 1.33 |
| 2. This course contributed to my educational development. | 2.81 | 1.37 |
| 3. This course contributed to my professional development. | 2.45 | 1.37 |
| 4. I Am satisfied with the level of interaction that happened in this course. | 2.56 | 1.38 |
| 5. In the future, I would be willing to take a fully online course again. | 2.50 | 1.5 |

Differences in undergraduate nursing students' engagement and satisfaction levels based on their demographic characteristics

The differences in nurses' engagement based on their demographical characteristics are presented in Table 4. Generally, female participants have statistically significantly higher scores in skills engagement ($M=3.67 \pm 0.92$) than the male participants ($M=3.48 \pm 0.93$) ($t(1,560)=-2.433$, $p=0.015$). Further, participants younger than 20 years old have statistically significantly lower engagement ($t(1,560)=-6.62$, $p<0.001$) and satisfaction ($t(1,560)=-10.50$, $p<0.001$) than the participants who were older than 20 years. In terms of marital status, married participants had statistically higher engagement scores ($F(21,559)=36.53$, $p<0.001$) than single participants and also had statistically higher satisfaction scores ($F(21,559)=88.4$, $p<0.001$) than single and divorced participants.

The participants who studied in public/governmental universities had statistically lower engagement scores ($F(2, 1,559)=38$, $p<0.001$) and satisfaction scores (Welch's $F(2,199)=116.2$, $p<0.001$) than participants who studied in private or military universities. In terms of academic level, the second-year students had statistically lower scores

Table 4: Differences in Nurses' Engagement and Satisfaction levels based on their Demographic Characteristics.

| Variable | Satisfaction | | Engagement | | Emotion subscale | | Skills subscale | | Participation subscale | | Performance subscale | |
|-----------------------------------|--------------|---------|-------------|---------|------------------|---------|-----------------|---------|------------------------|---------|----------------------|---------|
| | Mean, SD | p-Value | Mean, SD | p-Value | Mean, SD | p-Value | Mean, SD | p-Value | Mean, SD | p-Value | Mean, SD | p-Value |
| Gender^a | | 0.06 | | 0.340 | | 0.096 | | 0.015 | | 0.424 | | 0.722 |
| Male | 2.49 (1.33) | | 3.55 (0.91) | | 3.74 (0.99) | | 3.48 (0.93) | | 3.44 (1.09) | | 3.62 (1.07) | |
| Female | 2.70 (1.22) | | 3.62 (0.79) | | 3.88 (0.86) | | 3.67 (0.92) | | 3.37 (0.96) | | 3.59 (1.04) | |
| Age^a | | <0.001 | | <0.001 | | <0.001 | | <0.001 | | <0.001 | | <0.001 |
| ≤20 | 2.19 (1.10) | | 3.44 (0.80) | | 3.76 (0.92) | | 3.43(0.94) | | 3.16 (1.02) | | 3.49 (1.05) | |
| >20 | 2.86 (1.30) | | 3.72 (0.82) | | 3.96 (0.86) | | 3.77 (0.91) | | 3.47 (1.04) | | 3.73 (1.0) | |
| Marital status^b | | <0.001 | | <0.001 | | <0.001 | | <0.001 | | <0.001 | | <0.001 |
| Single | 2.45 (1.20) | | 3.55 (0.81) | | 3.84 (0.89) | | 3.57 (0.93) | | 3.27 (1.02) | | 3.59 (1.03) | |
| Married | 3.75 (1.23) | | 4.12 (0.74) | | 4.27 (0.71) | | 4.16 (0.79) | | 3.98 (0.96) | | 4.03 (0.87) | |
| Divorced | 2.97 (1.36) | | 3.60 (0.94) | | 3.86 (1.17) | | 3.83 (1.09) | | 3.15 (1.01) | | 3.59 (1.18) | |
| University^b | | <0.001 | | <0.001 | | <0.001 | | <0.001 | | <0.001 | | <0.001 |
| Public/Governmental | 2.24 (1.07) | | 3.45 (0.78) | | 3.74 (0.88) | | 3.49 (0.93) | | 3.15 (0.99) | | 3.49 (1.02) | |
| Private | 2.95 (1.37) | | 3.82 (0.86) | | 4.07 (0.89) | | 3.82 (0.93) | | 3.60 (1.08) | | 3.83 (1.01) | |
| Military | 3.73 (0.94) | | 3.71 (0.63) | | 4.03 (0.73) | | 3.72 (0.79) | | 3.48 (0.75) | | 3.59 (0.98) | |
| Academic year^b | | <0.001 | | <0.001 | | 0.009 | | <0.001 | | <0.001 | | <0.001 |
| Second year | 2.27 (1.17) | | 3.40 (0.84) | | 3.76 (0.91) | | 3.41 (0.94) | | 3.09 (1.07) | | 3.37 (1.04) | |
| Third year | 2.88 (1.32) | | 3.71 (0.81) | | 3.94 (0.88) | | 3.81 (0.91) | | 3.41 (1.03) | | 3.71 (1.03) | |
| Fourth year | 2.77 (1.24) | | 3.73 (0.81) | | 3.95 (0.87) | | 3.77 (0.91) | | 3.48 (1.01) | | 3.80 (0.96) | |

^aMeasured by independent sample t t-test. ^bMeasured by One Way ANOVA. Bold p-value represents significant results.

in total engagement ($F(2, 1,559)=13.3, p<0.001$) and satisfaction (Welch's $F(2,842)=23.9, p<0.001$) than other students in other academic levels.

The differences in the participants' engagement and satisfaction based on the provided e-learning circumstances are presented in Table 5. The participants who registered only in theoretical courses have statistically significantly higher satisfaction scores ($F(2, 1,559)=18.7, p<0.001$) than students who registered in both types of courses (i.e., theoretical and clinical). There was a significant difference in the participant's engagement scores ($F(3, 1,558)=3.08, p=0.026$) and satisfaction scores ($F(3, 1,558)=12.7, p<0.001$) based on the number of students per e-learning class. Participants who registered in classes that included more than 40 students exhibited lower scores in the engagement score than those who registered in classes that included 21–30 and 31–40 students. Besides, participants who registered in classes that included more than 40 students exhibited lower satisfaction scores than students who registered in classes that included less than 40 students.

Differences in engagement scores ($F(3, 1,558)=2.83, p=0.037$) and satisfaction scores ($F(3, 1,558)=4.7, p=0.003$) were also statistically significant according to the cumulative number of registered e-learning courses since starting the e-learning. Participants who registered for more than 10 courses had lower scores in engagement than those who registered for 8–10 courses. On the other hand, participants who registered for more than 10 classes had significantly lower satisfaction scores than other participants.

Regarding the preferable duration for e-learning classes/sessions, the results revealed a significant difference in students' engagement scores (Welch's $F(3, 94.2)=14.04, p<0.001$). More specifically, the participants who preferred a duration of 60 min sessions had statistically significantly lower engagement scores than those who preferred longer duration sessions. In terms of the difference in satisfaction, both the actual ($F(3, 1,558)=2.6, p=0.049$) and the preferable duration (Welch's $F(3, 93)=28.3, p<0.001$) significantly affected the participants' satisfaction. The result revealed that participants who attended classes/sessions that lasted for 90 min had lower satisfaction scores than those who attended classes/sessions that lasted for 120 min. On the other hand, participants who preferred a session duration of 60 min had lower satisfaction than students who preferred durations of more than 60 min.

In term of receiving training on computer and internet use, the results revealed that participants who received training on computer and internet use have statistically significantly higher satisfaction scores ($t(1,560)=5.3, p<0.001$) than those who did not receive any training. Besides, there were significant differences between the two groups in the mean score related to training on protective precautions, in which participants who were trained about protective precautions before starting clinical training had statistically significantly higher scores in the engagement ($t(1,560)=-6.5, p<0.001$) and satisfaction ($t(1,448)=-14.3, p<0.001$) than the participants who did not receive any training. Lastly, the participants who were satisfied with the clinical training during COVID-19 had statistically significantly higher scores in engagement ($t(1,560)=-9.87, p<0.001$) and satisfaction ($t(488)=30.8, p<0.001$) than the unsatisfied participants.

Relationships between students' engagement, students' satisfaction, and continuous variables

A Pearson correlation coefficient showed a significant positive correlation between the participants' engagement and their satisfaction during the COVID-19 pandemic ($r=0.55, p<0.001$). Further, the associations between nurses' engagement, satisfaction, and the continuous variables were tested using Pearson correlation coefficient (presented in Table 6). Regarding students engagement, the strongest significant correlation was with students' achievement of learning objectives during the e-learning ($r=0.49, p<0.001$), while the weakest correlation was with students' GPA out of 100 ($r=0.09, p<0.001$). Nevertheless, the strongest significant correlation with students' satisfaction levels was the students' achievement of their learning objectives during the e-learning experience ($r=0.69, p<0.001$), while the weakest correlation was with students' computer skills ($r=0.26, p<0.001$).

Table 5: Differences in the Students' engagement and satisfaction levels based on the provided e-learning circumstances.

| Variable | n (%) | Engagement | | Satisfaction | |
|---|--------------|-------------|------------------|--------------|------------------|
| | | Mean, SD | p-Value | Mean, SD | p-Value |
| Type of courses (theoretical vs. clinical)^b | | | 0.286 | | <0.001 |
| Theoretical courses only | 142 (9.1) | 3.54 (0.87) | | 3.21 (1.24) | |
| Clinical only | 8 (0.5) | 3.46 (0.76) | | 2.87 (1.26) | |
| Both | 1,412 (90.4) | 3.62 (0.82) | | 2.54 (1.25) | |
| Number of students per e-learning class/session^b | | | 0.026 | | <0.001 |
| 11–20 | 86 (5.5) | 3.64 (0.87) | | 2.82 (1.33) | |
| 21–30 | 193 (12.4) | 3.72 (0.86) | | 2.94 (1.30) | |
| 31–40 | 265 (17) | 3.70 (0.84) | | 2.82 (1.27) | |
| More than 40 | 1,018 (65.2) | 3.57 (0.81) | | 2.46 (1.23) | |
| Cumulative number of registered e-learning courses^b | | | 0.037 | | 0.003 |
| 1–3 | 153 (9.8) | 3.61 (0.85) | | 2.75 (1.32) | |
| 4–7 | 290 (18.6) | 3.57 (0.80) | | 2.76 (1.24) | |
| 8–10 | 322 (20.6) | 3.73 (0.80) | | 2.66 (1.30) | |
| More than 10 | 797 (51) | 3.58 (0.84) | | 2.49 (1.24) | |
| The actual duration of e-learning classes/sessions^b | | | 0.59 | | 0.049 |
| 60 min | 168 (10.8) | 3.53 (0.88) | | 2.52 (1.18) | |
| 90 min | 680 (43.5) | 3.62 (0.81) | | 2.53 (1.26) | |
| 120 min | 461 (29.5) | 3.61 (0.83) | | 2.73 (1.27) | |
| More than 120 min | 253 (16.2) | 3.63 (0.84) | | 2.61 (1.33) | |
| Preferable duration of e-learning classes/sessions^b | | | <0.001 | | <0.001 |
| 60 min | 1,031 (66) | 3.52 (0.84) | | 2.39 (1.20) | |
| 90 min | 455 (29.1) | 3.77 (0.75) | | 2.97 (1.31) | |
| 120 min | 41(2.6) | 3.98 (0.73) | | 3.41 (1.18) | |
| More than 120 min | 35 (2.2) | 3.73 (1.0) | | 2.92 (1.34) | |
| Trained on computer and the internet use^a | | | 0.070 | | <0.001 |
| Yes | 110 (7) | 3.75 (0.90) | | 3.22 (1.24) | |
| No | 1,452 (93) | 3.60 (0.82) | | 2.55 (1.26) | |
| Trained about protective precautions before starting clinical training^a | | | <0.001 | | <0.001 |
| Yes | 925 (59.2) | 3.72 (0.82) | | 2.82 (1.29) | |
| No | 637 (40.8) | 3.45 (0.80) | | 2.27 (1.17) | |
| Feels satisfied with the clinical training during COVID-19^a | | | <0.001 | | <0.001 |
| Yes | 345 (22.1) | 3.99 (0.76) | | 3.46 (1.35) | |
| No | 1,217 (77.9) | 3.50 (0.81) | | 2.36 (1.13) | |

^aMeasured by independent sample t t-test. ^bMeasured by One Way ANOVA. Bold p-value represents significant results.

Table 6: Relationships between students' engagement, students' satisfaction and continuous variables.^a

| Continuous variables | Engagement | Satisfaction |
|---|--------------------|--------------------|
| 1. GPA out of 100 | 0.09 ^b | -0.01 |
| 2. Computer skills | 0.34 ^b | 0.26 ^b |
| 3. University support (resources) | 0.34 ^b | 0.39 ^b |
| 4. Quality of internet connection | 0.34 ^b | 0.44 ^b |
| 5. Achievement of learning objectives during the e-learning | 0.49 ^b | 0.69 ^b |
| 6. Feeling competent enough to work independent after graduation | 0.46 ^b | 0.65 ^b |
| 7. Feeling that face to face teaching is important and cannot be replaced by virtual teaching for clinical case discussions | -0.14 ^b | -0.49 ^b |

^aMeasured by Pearson test correlation coefficient. ^bCorrelation is significant at <0.001.

Discussion

Nursing students' engagement and satisfaction with e-learning during the COVID-19 pandemic

The current study showed that most students were invested and engaged in their e-learning; they showed high emotional, skills, and performance engagement and low engagement in the participation domain. These findings, to some extent are consistent with two previous studies (Bolliger & Halupa, 2018; Li et al., 2020). Further, the students were moderately satisfied with the e-learning and showed lower satisfaction level compared to students in developing countries who reported high satisfaction with e-learning education (Bolliger & Halupa, 2018; Kuo & Belland, 2016). This result might be related to the differences in the available resources such as internet infrastructure and the availability and utilization of the high-fidelity simulation labs (Jaradat & Ajlouni, 2020).

Differences in nurses' engagement and satisfaction levels based on their demographic characteristics

Female students exhibited higher engagement in skills subscale as compared with males. This result is congruent with previous studies that showed female students use additional online resources to explore topics in more depth than male students (Kuchinski-Donnelly & Krouse, 2020; Martin & Bolliger, 2018), which might be related to differences in activity, collaboration and participation level between female and male students. Further, students' engagement and satisfaction were better among older students; this finding supports the results of a previous study (Adams et al., 2020). Those older students are more likely to be more engaged and satisfied because they have more experience in e-learning, and feel more comfortable and flexible when they attend the course out of campus because they have extra social responsibilities within a limited time (Bolliger & Halupa, 2018).

In terms of marital status, married students had higher engagement and satisfaction levels. Married students have many responsibilities in a limited time such as taking care of their spouse and children. Further, the limited time shifted priorities; altered interactions with friends and family, and can negatively impact student's engagement (Clark, 2014). Having the option to attend the courses from home allows for better time management and decreases the burden of several marital-related responsibilities; this flexibility and the extra time to do daily life activities have the potential to improve their satisfaction (Hamdan et al., 2021).

Students who study at governmental universities had a lower engagement and satisfaction than those who study in either private or military universities; besides, private university students had lower satisfaction than those from military universities. This finding was consistent with previous studies (Abbasi et al., 2020; Ansar et al., 2020; Hamdan et al., 2021). This result might be related to the differences in teaching methodology, course design, class size, information technology (IT) skills, technological support, learning environments, and in the handling of the general educational atmosphere (Naidu & Derani, 2016). Moreover, the academic level was another variable

affecting student's engagement and satisfaction. Second-year students have lower engagement and satisfaction than third and fourth-year students. These findings are congruent with several previous studies (Hamdan et al., 2021; Li et al., 2020). These findings might be related to individual factors such as maturity and experience level with e-learning methodology.

Differences in the students' engagement and satisfaction levels based on the provided e-learning circumstances

Regarding the e-learning characteristics, students who registered only in theoretical courses have higher satisfaction than students who registered in both types of courses. This finding supports the result of Suliman et al.'s (2021) study. This could also be related to perceiving the clinical training as insufficient to prepare the students for clinical practice after shifting to e-learning. On the same lines, students' engagement and satisfaction were negatively affected by a high number of students in class. This finding was congruent with another previous study that recommended keeping the class size within the optimum number to enhance students' engagement and satisfaction (Parks-Stamm et al., 2017). It could be postulated that large class sizes decrease students' engagement with learning, the quality of their note-taking and note-reading, and interactions with discussions and participation during lectures; thereby, decreasing their satisfaction (Lee et al., 2011; Qiu et al., 2012).

The number of registered online courses also affected the students' engagement and satisfaction. This result supports the findings of other studies which concluded that students who had past satisfactory experiences with online learning had better engagement (Alzahrani, 2017; Hixon et al., 2016). The results indicate that students rated some items differently based on their previous experience with online courses and their general acceptance of technology. Students who attended several online courses became more familiar with the platform and perceived it as easy to use. In the same context, this could also be related to the academic workload imposed on students who registered for more courses.

The preferable duration of the e-learning classes was another variable that affected students' engagement and satisfaction levels. This might be because of the insufficient time for students to interact and participate during the short classes. It is imperative to consider students' attention span in reaching an optimal class duration. Long duration classes should be avoided, and sufficient break times should be given between any two consecutive classes (Muthuprasad et al., 2021; Rafi et al., 2020). It should be noted that the actual duration of classes affected the students' satisfaction. A possible explanation for low satisfaction among students who attended short classes is that shorter duration classes had insufficient time for students to interact and participate; thus, they would be less satisfied. On the other hand, those who preferred short classes might be worried about the load and losing their attention during long classes (Menon et al., 2021; Rafi et al., 2020).

Students who received previous training on computer and internet use, had better engagement and higher satisfaction levels than those who did not receive any training. This finding supports a previous report on Jordanian students' need for skills training on using computers and internet to support them during the e-learning course (Muflih et al., 2020). Further, several studies assert that providing necessary technical help and support for students can ease students' anxieties to accommodate the new system and increase their engagement as well as their satisfaction levels (Al-Salman & Haider, 2021; Almusharraf & Khahro, 2020; Kuchinski-Donnelly & Krouse, 2020).

In the same context, students in the current study who were trained about PPEs before starting clinical training had better engagement, and higher satisfaction than those who did not receive any training. This finding is congruent with other previous studies, which concluded that attending COVID-19-related training before entering the clinical area and having an appropriate awareness and consistent advice for all staff regarding PPE are directly linked with higher students' compliance, better engagement and satisfaction in their clinical area, lower anxiety and stress levels, and higher student confidence level (Key et al., 2020; Nayahangan et al., 2021).

Likewise, students who were satisfied with the clinical training during COVID-19 had better engagement and higher satisfaction levels than other students. This result supports the findings of two recent qualitative studies in Jordan, where nursing faculty members and students narrated that teaching and testing learning skills online

negatively affect students' clinical readiness upon graduation because nursing is a profession that relies on skills acquired during clinical practice (Nabolsi et al., 2021; Suliman et al., 2021). On the other hand, few students preferred the e-learning method to learn clinical skills, which supports the results by Muflih et al., (2020). These findings could be related to students' perceptions that conducting online clinical training during the COVID-19 epidemic reduces disease transmission from direct contact in clinical areas (Zhou et al., 2020).

Relationships between students' engagement, students' satisfaction and continuous variables

The current study showed that there were positive correlations between nursing students' engagement and their satisfaction. These findings are congruent with the results of studies by Chan et al. (2021) and Guo (2018). Regarding the relationships between students' engagement, students' satisfaction and continuous variables, it is worth mentioning that "achieving students' learning objectives" and "feeling competent to work independently" had the strongest association with students engagement and their satisfaction. Course objectives and learning outcomes in online learning could be achieved effectively and efficiently if the learning environment mediated the relationship between learning experience, student engagement, and outcomes (Kanık, 2021). Besides, course objectives and learning outcomes achievement are essential factors that positively enhance students' satisfaction (Al-Shboul et al., 2013).

Furthermore, computer skills and quality of internet are crucial elements that correlate with student engagement and satisfaction with e-learning. These findings were supported by previous studies results (Alqurashi, 2019; Hamdan et al., 2021; Jaradat & Ajlouni, 2020). This shed light on the importance of assessing the available resources and factors that determine internet connection quality, such as differences in geographical areas and economic statuses among students. Finally, most students felt that face-to-face teaching was essential and could not be replaced by virtual teaching. This finding supports similar studies finding that distance education is not suitable for the clinical parts of the curriculum (Al-Balas et al., 2020; Suliman et al., 2021).

The study's strengths and limitations

This is the first study that examined Jordanian nursing students' engagement and satisfaction levels with e-learning during the COVID-19 pandemic. A key strength of the present study is the large sample size recruited from all nursing schools in Jordan. On the other hand, the current study used a correlation design; thus, inferring causation from the findings is cautioned. The relationship between the engagement dimensions and total satisfaction does not imply that one is the cause of the other.

The sampling technique is another limitation of this study. The sample was chosen by voluntary response sampling, which could lead to bias. To reduce the possibility of bias, we invited all students who enrolled in the bachelor's degree nursing e-learning program to participate in the study. Further, preset instruments using the Likert-typed scale limited student's chance to discuss or elaborate on the questions. Moreover, using a self-reported questionnaire may present response biases, such as social desirability. However, anonymous online responses may minimize these biases. Finally, the sample excluded first-year students who were assumed to lack sufficient experience with online learning.

Conclusions

The COVID-19 pandemic has created unique circumstances to conduct such a study among undergraduate nursing students who switched from classroom-based education to e-learning. The current study examined the students' engagement and satisfaction levels with e-learning during the COVID-19 pandemic.

The undergraduate nursing students were highly engaged with the e-learning. They demonstrated high emotional engagement as evidenced by their desire to learn the material; high skills engagement as evidenced by looking over class notes to make sure they understand the material; and high-performance engagement as evidenced by getting good grades. However, they had a low engagement in the participation subscale, characterized by not regularly posting in the discussion forum. Moreover, the students were moderately satisfied with the e-learning; they were mostly satisfied with the courses' contribution to their educational development and least satisfied with the courses' contribution to their professional development.

Based on the results, both engagement and satisfaction levels were also significantly and positively associated. Nursing faculty members and students need to be well prepared for this new teaching approach by creating a suitable learning environment that fosters the teaching and learning process and increases students' engagement and satisfaction.

Implications and recommendations

Implications to nursing education

The most significant contribution of the present research is that it provides insight into nursing student's engagement and satisfaction levels with e-learning during the COVID-19 pandemic. Faculty members and instructors should employ adequate measures to establish a curriculum that enhances significant students' engagement, such as group discussions, polling questions, and social media groups that communicate outside the class time.

Implications to practice

Based on the study results, it is necessary to examine the competency level of newly graduated nurses who attended online clinical training. It is also recommended to prepare remedial plans to improve their performance, increase the orientation duration and support them with intensive preceptorship programs, and modify the orientation courses to include not only the hospital-specific orientation but also nursing procedures.

Implications to policy

In this regard, it is recommended that universities use appropriate educational applications and platforms that facilitate the learning process for all students with different levels. Further, faculty administrations and policymakers in each educational institution are advised to establish a committee to provide technical and academic support, and proper training for the faculty members, instructors, and students. In the same line, this committee should perform frequent reviews and follow the e-learning infrastructure, course design, platform, class size, class duration, and educational materials.

All educational institutions should confirm that all students are prepared for this new approach by checking the availability of electronic devices, internet access, and strong internet signal to maintain good quality online education. Further, educational institutions should remind the students to prepare the selected topics, send prereading materials, answer the pretest before attending the online lesson, and provide them with online ground rules before starting any e-learning education session.

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