## **RESEARCH NOTE**

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# Relationship between information literacy and satisfaction with quality of virtual education in Iranian nursing students during the COVID-19

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## Abstract

**Background** There is a need to survey the quality of online education and the level of students' academic satisfaction and evaluate their learning experience to improve the quality of online education, especially for graduate students. Therefore, the present study investigated relationship between information literacy and satisfaction with quality of virtual education in Iranian nursing students during the COVID-19.

**Methods** This is a cross-sectional descriptive study that was conducted on 80 nursing master's students who were enrolled in the study using convenience sampling. This study was conducted using data collection tools including four questionnaires of demographic information, quality of online education, academic satisfaction, and educational information literacy of the learning and study strategies inventory (LASSI).

**Results** The mean score of the Iranian nursing students' information literacy was  $63.78 \pm 9.14$ , and that of their quality of virtual education was  $151.72 \pm 22.93$ . In addition, their mean score of satisfaction with virtual education was found to be  $70.29 \pm 25.77$ , respectively. The results showed that there was a direct correlation between information literacy on the one hand and quality of virtual education (r=0.78, p<0.001) and satisfaction with virtual education (r=0.73, p<0.001).

**Conclusion** According to the results of the present study, given the direct relationship between information literacy and students' satisfaction with the quality of online education, it is suggested that education planners should take measures to improve the students' information literacy.

Keywords Satisfaction, Nursing students, COVID-19, Quality, Information literacy

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## Introduction

The rapid spread of the coronavirus (COVID-19) led to a global pandemic and affected millions of people as well as all aspects of human life [1]. It even created tremendous challenges in the global education sector [2]. With the onset of COVID-19, many educational institutions were closed, and their educational methods changed. It is worth noting that teaching and learning did not stop completely even at the peak of this crisis, but since it was no longer possible to carry out traditional face-toface teaching activities, universities were forced to shift educational activities to online education [3]. Since the beginning of the third millennium, the use of teaching



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and learning tools based on information and communications technology (ICT) has expanded with an accelerated trend and online learning is now considered as a conventional learning environment in the information age [4]. Therefore, it is obvious that many studies are conducted on this type of learning all over the world. Meanwhile, not only various plans were made to apply online learning in higher education centers in Iran, but also many studies also focused on this educational innovation using different approaches [5]. However, it seems that with the outbreak of the COVID-19 pandemic and the announcement of special conditions in March 2019, quarantine was imposed on online education in Iran, like other parts of the world, which was unparalleled in terms of the volume of demand and implementation conditions. Online education has significant advantages, including the constraints of scheduled classes, time and place constraints, and the facilitation of the provision of education to people who may not be able to participate in face-to-face classes, such as housewives, hospitalized people, shift workers, passengers, etc. [6]. However, this rapid and widespread transition from face-to-face education to online education brought about many challenges for learners, teachers, managers, and employees of educational institutions. That is, providing and using an online education system has become a big concern for many universities [7]. These challenges affect the students' satisfaction. Academic satisfaction is one of the most important considerations that impact the continuation of online learning [8]. Academic satisfaction refers to the degree of enjoyment and satisfaction of a person from his role and experiences as a student [9]. The level of academic satisfaction can be an effective index in optimizing the students' performance, such as commitment to the goals of the university, successful graduation, adaptation to the university, and overall satisfaction with life and the success rate of universities [10]. Improving the quality of education and learning is one of the important issues in academic institutions and an effective factor in measuring the quality of learning and education [11]. During the investigation of online education and the process of using technology in education, the learners' information literacy becomes very important. Having information literacy skills in online education environments is more important than conventional education [12]. The term information literacy was first proposed by Zurkowski and refers to a set of special skills to access the required information from a multitude of available information. Information literacy is defined as a set of abilities that requires individuals "to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information" [13].

Familiarity with information literacy skills, which includes library literacy, computer literacy, and internet literacy [14], is more necessary for online students than other learners. Also, given that graduate students deal more with research and problem-solving, it is of double necessity to measure and teach them information literacy skills [15].

A study was conducted by Kanagaraj, et al. to investigate the level of nursing students' satisfaction with the quality of online education in COVID-19 on 1166 students from 4 universities in India. The results indicated that most of the students (51%) were satisfied with the quality of online education in theoretical courses during the COVID-19 pandemic; however, in practical and clinical courses the students' satisfaction was at a moderate level. The authors recommend that a combination of faceto-face and online education should be presented during COVID-19 and other pandemics for effective learning in nursing practical courses [16]. The results of a systematic review of 15 studies conducted in Iran by Beheshti Fard et al. revealed that the medical students' satisfaction with the quality of online education was at a moderate level [17]. Also, the results of a study conducted in Egypt by Eltaybani et al. revealed that the nursing students' and educators' satisfaction with the quality of online education was at a moderate level. The results also revealed that most participants did not receive adequate training on the use of e-learning before the pandemic [18].

Many studies have been conducted on the opportunities and challenges of virtual education for medical students during the COVID-19 pandemic in other countries. Also, the majority of these studies have been carried out to investigate nursing students' satisfaction with the quality of online learning. To the best of our knowledge, no study has investigated post-graduate nursing students' information literacy and satisfaction with the quality of online education during the COVID-19 pandemic. Therefore, the present study investigated the relationship between information literacy on the one hand and satisfaction and quality of online education on the other hand in postgraduate nursing students during the COVID-19 pandemic in Iran.

## Main text

### Study design

This cross-sectional descriptive study was conducted on postgraduate nursing students of Shiraz University of Medical Sciences in the south of Iran during semesters two to five in 2022. The local Ethics Committee of Shiraz University of Medical Sciences, Shiraz, Iran approved the study (Ethical code: IR.SUMS.REC.1400.036), and informed consent was obtained.

## Inclusion and exclusion criteria

The inclusion criteria were passing at least two academic semesters of online education, being a postgraduate nursing student, being willing to participate in the study and complete the informed consent form, being able to communicate, being able to use the Persian language, and not having mental and alertness problems. The exclusion criteria included the students' transfer or academic leave, incomplete questionnaires, and unwillingness to continue participation in the research.

## Sampling and the study population

The study community included postgraduate nursing students in Shiraz University of Medical Sciences who were studying in the semesters two to five in 2022. A convenience sampling design was utilized in the current survey to recruit postgraduate nursing students. The minimum needed sample size was calculated through the power analysis procedure described by Cohen [19]. Considering an  $\alpha$  of 0.05, power of 0.8, medium effect size, and correlation testing as the highest needed statistical procedure, the minimum required sample was 85 postgraduate nursing students.

The number of potential participants was approximately 101 postgraduate nursing students who were all invited to participate. 21 students were excluded for various reasons: maternity leave (5 participants), lack of participation because of their busy schedules (12 participants), and withdrawal from the study due to being infected with COVID-19 (4 participants); therefore, 80 participants filled out the questionnaires. The response rate was 79.20%.

## Data collection tools

Four data collection tools were used in this study:

## **Demographic information**

The first one included demographic information such as age, gender, semester grade point average (GPA) of the previous semester, total grade point average (GPA), field of study, number of units selected in the current academic semester, place of residence, and marital status.

## Online -learning education quality questionnaire

The second one was the online e-learning education quality questionnaire designed by Hakimzadeh et al. [20], which was designed based on the quality evaluation criteria of online courses by Paechter et al. [21]. This questionnaire includes 5 areas: educational design (6 questions), interaction (9 questions), course content (6 questions), individual learning opportunity (4 questions), and course evaluation (7 questions) that are scored using a 6-point Likert scale from Unfavorable (1) to Completely favorable (6). The total score is calculated through the mean score of the comments announced in each category. Mean scores of  $\geq$  3.5,  $\leq$  3.5, and  $\geq 4$  indicate relatively favorable, unfavorable, or favorable quality, respectively. The content validity of the questionnaire was confirmed by the ten professors of the department of methodology and curriculum, Faculty of Psychology and Educational Sciences, University of Tehran, and the seven professors of the department of medical education, Faculty of Medicine, Tehran University of Medical Sciences. The Cronbach's reliability coefficient of this tool was also confirmed in a pilot study (n = 30 people) conducted by Hakimzadeh et al. ( $\alpha = 0.95$ ) [20].

## Satisfaction online education questionnaire

The third instrument was the academic satisfaction questionnaire designed by Sheikh Taheri and Dehnad. This electronic questionnaire consists of 26 questions scored using a 5-point Likert scale ranging from completely agree to completely disagree. The possible score range is 26 and 130, and the scores < 45, 45.5–90, and 91–130 indicate low, moderate, and high satisfaction, respectively. Content validity and reliability of this instrument have been confirmed. Also, Cronbach's alpha of the questionnaire was calculated 0.94 [22].

# Educational information literacy of the learning and study strategies inventory (LASSI)

The fourth questionnaire used in this study was the learning and study strategies inventory (LASSI) designed by Weinstein and Palmer, in which the questions are scored based on a 5-point Likert scale. It measures the students' information literacy skills based on the standards of information literacy capacities for academic studies [23]. This questionnaire includes 5 standard subscales: the ability to determine the nature of information, effectively access information, critically evaluate information, use information correctly and effectively, and understand the ethical and legal issues of access to information. All questions are close-ended and scored based on a 5-point Likert scale ranging from 1 =completely disagree to 5 = completely agree. In a study by Bazrafkan et al., this questionnaire was translated into Farsi by 2 experts, and its validity was confirmed by professors and experts; its total reliability was confirmed by Cronbach's alpha method ( $\alpha = 85\%$ ), and the reliability for each subscale was calculated as follows: the ability to determine the nature of information (0.82), effectively access information (0.75), critically evaluate information (0.71), use

information correctly and effectively (0.80), and understand ethical and legal issues (0.77) [24].

#### Data analysis

In this study, the collected data were analyzed using appropriate statistical tests through SPSS version 22, and a P-value < 0.05 was considered as the significance level. The normality of quantitative variables was tested using the Kolmogorov–Smirnov test. Frequency distribution, number, and percentage were used to describe the qualitative data, and mean and standard deviation were used to describe quantitative data. In the inferential statistics section, Chi square, One-way analysis of variance (ANOVA), Independent samples T-test, and Spearman correlation coefficient tests were used.

## Results

The description of the qualitative and quantitative variables of the participants in the study is shown in Table 1. Among the 80 participants, 51.2% (n=41 people) were women and 48.8% (n=39 people) were men. Most of the

participants were single, 3rd semester students, dormitory residents, and pediatric nursing students. It should be noted that most of the students were moderately satisfied with online education. Also, the mean  $\pm$  SD, of the students' age was  $21.01 \pm 1.52$ , their previous semester grade point average (GPA) was  $16.11 \pm 1.07$ , their total GPA was  $16.28 \pm 1.05$ , and their number of units in that semester was  $19.22 \pm 1.01$ .

Table 1 also shows the relationship between qualitative and quantitative demographic variables with satisfaction with online education. As shown, there was a significant relationship between satisfaction with online education and place of residence, so that dormitory residents were more satisfied with online education than those who were living at home with their families or alone.

The results also showed no significant relationship between GPA of the previous semester, total GPA, and number of units with satisfaction with online education. The results of the Spearman correlation coefficient test showed that there was no relationship between the dimensions of virtual education quality and information

**Table 1** Demographic features of the subjects and relationship between qualitative and quantitative demographic variables with satisfaction of online education

Qualitative Variables		N(%)	Low satisfaction (N = 12)	Moderate satisfaction (N=21)	High Satisfaction (N = 44)	P-value	Effect size
Gender	Female	41(52.1)	7 (17)	23 (57)	11 (26)	0.74*	0.15
	Male	39(48.2)	6(15.38)	20(51.28)	13 (33.33)		
Marital	Married	34(42.5)	8 (23.52)	17 (50)	9 (26.48)	0.47*	0.21
status	Single	46(57.5)	5 (10.86)	26 (42.85)	15 (32.62)		
Semester	2	21(26.3)	5(23.80)	9 (42.85)	7 (33.33)	0.88*	0.11
	3	43(53.8)	4(9.30)	26 (60.46)	13 (30.23)		
	4	11(13.8)	4 (36.4)	4 (36.4)	3 (27.2)		
	5	5(6.3)	1 (20)	3(60)	1 (20)		
Field of study	Medical-Surgical Nursing	16(20)	2 (12.5)	10 (62.5)	4 (25)	0.21*	0.26
	Pediatric nursing	32(40)	5(15.62)	20 (62.5)	7 (21.88)		
	Geriatric nursing	20(25)	4 (20)	8(40)	8(40)		
	ICU nursing	8(10	1 (12.5)	4 (50)	3 (37.5)		
	Nursing Manage- ment	4(5)	2 (50)	0 (0)	2 (50)		
Place of residence	Dorm	38(47.5)	1 (2.6)	24 (63.2)	13 (34.2)	0.02*	0.41
	With family	31(38.8)	7 (22.58)	16 (51.62)	8 (25.80)		
Quantitative vari- ables	Alone live	11(38.7)	5 (45.45)	3 (27.27)	3 (27.27)		
Age		21.2±1.52(19-27)	21.41 ± 2.35(19-26)	20.87±1.28(20-27)	20.87±1.32(19-26)	0.115**	0.23
GPA of the previous semester		16.11±1.07(14-18)	15.9±0.99 (14-17)	16.3±1.51(14–18)	16.09±0.88(14-18)	0.181**	0.21
Total GPA		16.28±1.05(16-18)	15.81±1.04(16-17)	16.38±1.13(16-18)	16.25±0.88(16-18)	0.131**	0.23
Number of study units		19.22±1.01 (15-23)	19.13±1.38 (16-23)	19.18±1.04 (15-22)	19.36±0.77(17-21)	0.439**	0.15

GPA: grade point average

\* Chi-square test

\*\* One-way analysis of variance (ANOVA)

literacy with the GPA in the previous semester, the total GPA, and the number of units, but there was a direct relationship between the professor-student interaction and their GPA in previous semester.

Moreover, there was no significant relationship between the dimensions of the quality of online education and information literacy with the study field and gender. Also, there was no relationship between the dimensions of the quality of online education with marital status, but information literacy was higher in single subjects than the married ones (p=0.02) (Table 2). The results also showed a relationship between the educational design, professor-student interaction, student-student interaction, course content, and course evaluation with the place of residence; that is, the dormitory residents obtained a higher score in all the above dimensions. (Table 2). The results also revealed a relationship between all aspects of the quality of online education with academic satisfaction; that is, students with high satisfaction obtained higher scores in the dimensions of quality of online education, but there was no relationship between information literacy and academic satisfaction. (Table 3). The results showed that there was a significant and direct correlation between information literacy on the one hand, and quality of online education (r=0.78, p<0.001) and satisfaction with online education (r=0.73, p<0.001) on the other hand in postgraduate nursing students during the COVID-19 pandemic. Also, it was found that there was a significant and direct correlation between

**Table 2** The comparison of the dimensions of the quality of online education and information literacy with the variables of marriage and place of residence

Dimensions of the quality of online education	Married	Single	P-valuě	Effect size	
Instructional design	16.11±5.40	15.52±5.23	0.62	0.49	
Professor-student interaction	$11.94 \pm 4.09$	$12.52 \pm 4.31$	0.54	0.61	
Student-student interaction	$15.05 \pm 5.83$	$17.32 \pm 6.90$	0.12	- 1.54	
Course content	$17.57 \pm 15.6$	$19.51 \pm 6.52$	0.19	- 1.31	
Individual learning opportunities	$13.58 \pm 4$	14.76±4.21	0.21	- 1.25	
Course evaluation	$21.45 \pm 7.26$	$22.77 \pm 7.57$	0.44	- 0.77	
Information literacy	61.14±9.38	$65.73 \pm 8.54$	0.02	- 2.27	
Dimensions of the quality of online education	Dorm	With family	Alone at home	P-value*	Effect size
Instructional design	18.15±5.33	13.93±4.50	12.72±3.46	0.001	0.46
Professor-student interaction	$13.57 \pm 3.37$	$11.22 \pm 4.46$	$10.72 \pm 5.04$	0.02	0.35
Student-student interaction	$18.81 \pm 5.57$	$14.35 \pm 6.18$	13.54±7.94	0.005	0.34
Course content	$21.38 \pm 4.91$	16.11±6.21	$15.90 \pm 7.82$	0.001	0.38
Individual learning opportunities	$15.21 \pm 3.50$	$13.45 \pm 4.41$	13.27±5	0.14	0.18
Course evaluation	$24.26 \pm 5.74$	$20.48 \pm 8$	$19.40 \pm 9.66$	0.05	0.27
Information literacy	$65.02 \pm 10.10$	$62.12 \pm 7.76$	64.18±9.32	0.42	0.14

\* Independent sample t-test

\*\* One-way analysis of variance (ANOVA)

**Table 3** The correlation between satisfaction with online education and the quality of online education and information literacy

Variable	Low satisfaction	Moderate satisfaction	High satisfaction	P-valuė	Effect size
Instructional Design	10.91±4.27	16.34±3.91	17.95±6	< 0.001	0.67
Professor-student interaction	$6.5 \pm 4.01$	13.17±3.62	$14.41 \pm 1.24$	< 0.001	1.14
Student-student interaction	8±5.42	15.97±3.92	$22.62 \pm 3.34$	< 0.001	1.46
Course content	$7.75 \pm 3.16$	19.56±4.14	24.61±1.19	< 0.001	2.21
Individual learning opportunities	$9.41 \pm 4.50$	13.65±3.23	18±1.69	< 0.001	1.23
Course evaluation	$10.75 \pm 6.78$	21.87±5.08	$28.50 \pm 2.28$	< 0.001	1.69
Information literacy	$59.83 \pm 5.92$	64.29±9.15	$65.70 \pm 10.33$	< 0.001	0.28

\* One-way analysis of variance (ANOVA)

Variable	Information literacy	Satisfaction of online education	Quality of online education
Information literacy	1	r=-0.73 P<0.001	r=-0.78 P<0.001
Satisfaction of online education		1	r=-0.89 P<0.001
Quality of online education			1

**Table 4** The correlation between information literacy, satisfaction with online education, and quality of online education in postgraduate nursing students

Spearman correlation coefficient

the satisfaction of online education and the quality of online education (r = 0.89, p < 0.001) (Table 4).

## Discussion

The research results showed that more than half of the students were moderately satisfied with online education. In the same line with the present study, Saadat, et al. showed that more than half of the students (70%) had moderate to high satisfaction with online education [24]. Although the home guarantine made the use of online education inevitable and even the fear of illness and death caused the students to prefer online education to face-to-face classes, the results of several pre-pandemic studies, like that of Zolfaghari et al. reported a high level of satisfaction [25]. Overall, it is indicated that online education has been accepted and welcomed by students over the years and they are satisfied with its nature, but the weaknesses should be identified and eliminated, so that satisfaction is increased [26]. However, in the study conducted by Rajabiian et al. [27], students had a lower satisfaction with online education as compared to the present study, which can be due to the difference of the studied population. Although both studies investigated the views of health and nursing students, it is noteworthy that the course units are very different among different branches of medical sciences, and some fields of study offer more practical units. Hence, these different results can be justified.

The results of the present study showed a significant relationship between satisfaction with online education and the place of residence; the students living in the dormitory were more satisfied with online education than those who were at home with their families or alone, which can be due to the availability of the Internet and computers in most of the dormitories, the use of Internet skills, and the experience of students.

However, there was no significant relationship between satisfaction with online education with age and gender variables, which is consistent with the results of some studies [28, 29]. The results of the present study indicated a significant relationship between satisfaction with online education with all aspects of the quality of online education (educational design, professor-student interaction, student-student interaction, course content, individual learning opportunities, and course evaluation); students with high satisfaction obtained higher scores in all dimensions of online education quality. In the same line with the present study, Yazdanparast et al. [10] investigated the opinions of medical students about the quality of online education courses at Bushehr University of Medical Sciences during the COVID-19 pandemic. They concluded that 84.8% of the students agreed to attend online education courses at the university; also, 57.7% of them were satisfied with the quality of online education during the COVID-19 pandemic.

As to the relationship between educational design and students' satisfaction with online education, consistent with the present study, Paechter et al. showed that the achievement of course objectives in educational design was the best factor to achieve success and student satisfaction. There are other factors such as transparency in the course structure that predict student satisfaction [21].

The professor-student interaction, as another dimension of the quality of online education, can increase the students' interest and satisfaction in the educational environment and ensure timely completion of assignments and involvement in educational activities. Also, professors should adopt strategies to encourage and motivate students. The results of this research are consistent with those of the studies carried out by Momeni Rad [30] and Norollahee et al. [31] who evaluated the interaction used in electronic courses as favorable. Because it is the age of information and communication, the outbreak of the coronavirus in Iran and the world, and the closure of schools, the shift towards online learning is not a choice but a compulsion. In this regard, suitable computer equipment, hardware, and software can be a guarantee for the utmost excellence of education in a successful educational environment of information technology, but most importantly, professors and students with sufficient information literacy get the most benefit from information education. Nations with advanced education put a great emphasis on the integrated education of information technology, in which information literacy is considered an important factor [32].

In the current study, except for marital status, the information literacy of students had no significant relationship with other demographic variables such as GPA of the previous semester, total GPA, number of units, academic semester, field of study, age, gender, and place of residence. Sufficient motivation and energy to learn, adequate cost and time, and more focus on learning new material can be among the influencing factors that have increased the information literacy of single students compared to married ones. It was also found in the study by Ghassemi and Noruzi [33] that there was no significant relationship between the gender of teachers in Bileh Savar County, Ardabil, Iran, and their information literacy. However, a study on the relationship between teachers' information literacy and attitude toward online learning during the COVID-19 pandemic by Kadkhoda and Nastiezaie [34] concluded that female teachers had higher information literacy compared to male ones, and this discrepancy can be attributed to the different environments of the two studies.

In the present study, there was no significant relationship between information literacy and satisfaction with online education. The lack of advanced learning opportunities and failure to promote information literacy during the COVID-19 crisis can be one of the reasons for the students' negligence of the beneficial effect of information literacy and the lack of a significant relationship between these two variables. Creedy et al. [35] investigated the perceptions of undergraduate nursing students regarding the online learning environment, computer literacy skills, and technology use, and their effects on their satisfaction. A total of 61.4% of the graduated students reported that they had effective information literacy skills.

Moreover, there was a relationship between the overall satisfaction with online educational programs and the level of information technology (IT) skills, perceived quality, and usefulness of Internet content. As nursing programs use web-based resources more frequently, more attention should be paid to the initial assessment and development of students' information literacy skills; however, as Mansouri Nejad et al. highlight, there is a lack of concern as to classroom assessment [36]. Students with good IT skills are likely to find web-enhanced content useful.

## Limitations

The present study was conducted on a small sample of nursing students at Shiraz Nursing School, in the south of Iran. Therefore, to yield more reliable results regarding the relationship between the level of information literacy and the satisfaction of postgraduate nursing students with the quality of online education, studies on a larger scale are warranted. Also, the survey was conducted using a non-probability convenience sampling design at Shiraz Nursing School in the south of Iran; this inflicts caution regarding the generalizability of the results.

## Implications in nursing education and future research

The education authorities are recommended to take measures to facilitate the online education in such situations as pandemics integrated with face-to-face learning in the form of blended learning, so that the students can learn more effectively and the challenges could be more appropriately removed. Nursing education had a transformation during the COVID-19 pandemic. Thus, the programs designed for nurse educators should incorporate online course coordination and management competencies into the curricula of nursing. In online nursing courses, sufficient support should be provided for the students, so that they can have adequate access to the faculty; also, the faculty should be provided with resources to enhance their knowledge and skills in designing online courses and using management strategies. Moreover, the results of this study can be a background for conducting future studies in this field in other countries.

## Conclusion

According to the results of the present study, the nursing students' satisfaction with the quality of online education is at a moderate level. Therefore, the education authorities are recommended to employ such strategies as developing the online education infrastructures, so that the students' satisfaction is increased in similar future pandemics. Moreover, given the direct relationship between information literacy and students' satisfaction with the quality of online education, it is suggested that education planners should take measures to improve the students' information literacy.

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#### Author contributions

ZD was involved in the conception and organization of the study. NS,LB,and MB were involved in the conception, execution, and data collection of the study; MB and ZD participated in statistical analysis design and/or execution. All authors contributed to the preparation and critical review of the manuscript, and all of them approved the final draft.

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#### Availability of data and materials

The datasets generated and/or analyzed during the current study are not publicly available due to the necessity to ensure participant confidentiality policies and laws of the country, but they are available from the corresponding author on reasonable request.

#### Declarations

#### Ethics approval and consent to participate

All the participants gave written informed consent to participate in the study. The present study was conducted based on the principles of the revised Declaration of Helsinki. The participants were assured of their anonymity and confidentiality of their information. Moreover, the study was approved by the Institutional Research Ethics Committee of Shiraz University of Medical Sciences, Shiraz, Iran (Ethical code: (IR.SUMS.REC.1401.409).

#### Consent to publication

Not applicable.

#### **Competing interests**

The authors declare no competing interests.

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#### References

- 1. Wang C, Pan R, Wan X, Tan Y, Xu L, Ho CS, et al. Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. Int J Environ Res Public Health. 2020;17(5):1729.
- Crawford J, Butler-Henderson K, Rudolph J, Malkawi B, Glowatz M, Burton R, et al. COVID-19: 20 countries' higher education intra-period digital pedagogy responses. J Appl Learn Teach. 2020;3(1):1–20.
- Moradi Y, Baghae R, Feizi A, Hajialibeigloo R. Strengths and weaknesses of asynchronous E-learning in nursing education throughout the COVID-19 crisis: a qualitative study. Iran Red Crescent Med J. 2022;24(6):9.
- Maghsoudi M, Safaee F, Hashemi A. Quality assessment of virtual education during the corona epidemic period from the perspective of professors and students of Farhangian University of Central Province. Educ Technol. 2022;16(3):525–38.
- Hadidi N, Seifoori Z, Jahanban IH. The comparison of Tabriz high school EFL teachers' attitudes toward integrating technology in the classroom based on their demographics. J Foreign Lang Res. 2020;10(3):526–41.
- Valverde-Berrocoso J, Garrido-Arroyo Md, Burgos-Videla C, Morales-Cevallos MB. Trends in educational research about e-learning: a systematic literature review (2009–2018). Sustainability. 2020;12(12):5153.
- Adnan M, Anwar K. Online learning amid the COVID-19 pandemic: students' perspectives. Online Submiss. 2020;2(1):45–51.
- Ali S, Naseer S, Nadeem A. Perceived teachers' support and academic achievement: mediating role of students' satisfaction with online learning in medical and non-medical students during COVID-19. J Psychiatry. 2021;22(9):1–10.
- 9. Manee FM. Testing of social-cognitive model of academic satisfaction in undergraduate students. J Psychol. 2013;17(2):201–19.
- Yazdanparast A, Lashgari Kalat H, Marvi N. A survey of medical students' opinions on the quality of virtual education courses held in Bushehr university of medical sciences during the COVID-19 pandemic. Med Educ Bull. 2020;1(2):77–86.
- Al-Rahmi WM, Yahaya N, Aldraiweesh AA, Alamri MM, Aljarboa NA, Alturki U, et al. Integrating technology acceptance model with innovation diffusion theory: an empirical investigation on students' intention to use E-learning systems. IEEE Access. 2019;7:26797–809.

- Keshavarz M, Farajollahi M, Sarmadi M, Zandi B. Students' information literacy level in a distance educational system: a case study. Education Strategies in Medical Sciences. 2015;8(4):231–7.
- Zurkowski PG. The information service environment relationships and priorities. National commission on libraries and information science. 1974. www.eric.ed.gov/ERICDocs/data/ericdocs2sql/content\_storage\_ 01/0000019b/80/36/a8/87.pdf
- Lloyd A, Anne Kennan M, Thompson KM, Qayyum A. Connecting with new information landscapes: information literacy practices of refugees. J Doc. 2013;69(1):121–44.
- Forster M. Six ways of experiencing information literacy in nursing: the findings of a phenomenographic study. Nurse Educ Today. 2015;35(1):195–200.
- Kanagaraj P, Sakthivel R, Christhumary PC, Arulappan J, Matua GA, Subramanian U, et al. Nursing student's satisfaction with virtual learning during COVID-19 pandemic in India. SAGE Open Nurs. 2022;8:1–8. https://doi. org/10.1177/23779608221144933.
- Beheshti Fard Sh, Anvari Ardekani S, Ahmadi R, Imannezhad Sh, Rajabzadeh Z, Ahmadi Z. The satisfaction with virtual education and related factors from the perspective of medical students during the COVID-19 pandemic: a systematic review. Med Edu Bull. 2022;3(4):599–614. https:// doi.org/10.22034/MEB.2023.389106.1075.
- Eltaybani S, Abdelhalim GE, Abdelgawad ME. Nursing students' and educators' experience with e-learning during a pandemic: an online survey. Nurs Forum. 2021. https://doi.org/10.1111/nuf.12634.
- 19. Cohen J. A power primer. Psychol Bull. 1992;112(1):155.
- Hakimzadeh R, Afandideh N. Qualification of e-learning medical education courses of Tehran University of Medical Sciences. Educ Strateg Med Sci. 2014;7(4):257–64.
- Paechter M, Maier B, Macher D. Students' expectations of, and experiences in e-learning: their relation to learning achievements and course satisfaction. Comput Educ. 2010;54(1):222–9.
- 22. Sheikh Taheri A, Dehnad A. Investigating the views of students of Iran University of Medical Sciences on the use of e-learning management system. Research Project Iran University of Medical Sciences. 2020.
- 23. Weinstein CE, Palmer DR. Learning and study strategies inventory (LASSI): user's manual. Clearwater: H & H Publishing; 2002.
- Bazrafkan L, Hayat AA, Abbasi K, Bazrafkan A, Rohalamini A, Fardid M. Evaluation of information literacy status among medical students at Shiraz university of medical sciences. J Adv Med Educ Prof. 2017;5(1):42.
- Saadat M, Moradi N, Yazdi MS, Orakifar N, Beydokhti MH, Behdarvandan A, et al. The effect of a virtual grand round on satisfaction and the level of learning of physiotherapy and speech therapy students during the coronavirus pandemic. J Med Educ Dev. 2021;16(1):1–12.
- Zolfaghari M, Mohammadi A, Hashemikamangar SS. Effect of linear versus adaptive electronic continuing medical education regarding dental bleaching on dentists' knowledge and satisfaction. Res Dev Med Educ. 2021;10(28):1–6. https://doi.org/10.34172/rdme.2021.028.
- Rajabiian M, Saeedi M, Khakshour A, Saeidi Kh, Alipour-Anbarani M. Iranian students' satisfaction with virtual education during the COVID-19 pandemic: a systematic review. Med Edu Bull. 2023;4(1):625–39. https:// doi.org/10.22034/MEB.2023.387312.1074.
- Derakhshanfard S, Mortazavi Z, Ghanbari E, Mortazavi SS. Identifying the effective factors in the inappropriate use of virtual education in the days of COVID-19 from the perspective of students. Horiz Med Educ Develop. 2021;12(3):59–72. https://doi.org/10.22038/hmed.2021.53361.1104.
- 29. Cohen E, Davidovitch N. The development of online learning in Israeli higher education. J Educ Learn. 2020;9(5):15–26.
- Momeni Rad A, Ali AK. An investigation of the quality of e-learning courses based on e-learning standards in the field of information technology engineering in Khajeh Nasir al-Din Toosi university of technology. Quart Educ Meas. 2012;2(7):121–38.
- Norollahee S, Hakimzadeh R, Seraji F, Nazarzadeh ZM. The evaluation of e-learning courses in hadith science virtual faculty according to the criteria of quality in E-Learning from the views of students and instructors. Interdiscip J Virtual Learn Med Sci. 2013;4(2):1–12.
- Moghaddaszadeh H, Yaminfirooz M, Alimohamadi K. An investigation of the relationship between information literacy skills and effectiveness of teachers: a case study of primary school teachers in Sari city. Libr Inf Sci Res. 2016;6(1):306–20.

- Ghassemi P, Noruzi A. Exploring information literacy of teachers. Acad Librariansh Inform Res. 2017;51(1):6.
- Kadkhoda S, Nastiezaie N. The relationship of teachers' Information literacy with the attitude to e-learning in the period of Covid-19 pandemic. Technol Educ J (TEJ). 2021;16(1):135–46.
- Creedy DK, Mitchell M, Seaton-Sykes P, Cooke M, Patterson E, Purcell C, et al. Evaluating a Web-enhanced bachelor of nursing curriculum: perspectives of third-year students. J Nurs Educ. 2007;46(10):460–7.
- Mansouri Nejad A, Pakdel F, Khansir AA. Interaction between language testing research and classroom testing practice. Educ Proc Int J. 2019;8(1):59–71.

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