Relationship between information and communications technology engagement with online self-regulated learning in nursing students of Mazandaran University of medical sciences

Masoumeh Bagheri-Nesami[1,2], Soleiman Ahmady[3], Noushin Kohan[1]

[1]Department of Medical Education, Virtual University of Medical Sciences, Tehran, [2]Traditional and Complementary Medicine Research Center, Addiction Institute, Mazandaran University of Medical Sciences, Sari, [3]Department of Medical Education,Virtual School of Medical Education and Management, Shahid Beheshti University of Medical Sciences, Tehran, Iran

ORCID:
Masoumeh Bagheri-Nesami: https://orcid.org/0000-0002-0962-4149;
Noushin Kohan: https://orcid.org/0000-0002-8163-742X

Abstract

Context: It seems that more students' engagement in the e-learning environment leads to the use of more self-regulated techniques in them; finally, they achieved more success.

Aim: This study aimed to determine the relationship between information and communications technology (ICT) engagement with online self-regulated in nursing students of Mazandaran University of Medical Sciences.

Setting and Design: This research is a correlational study. The study population included all undergraduate nursing students in the 2nd to 6th semesters of Mazandaran University of Medical Sciences.

Materials and Methods: The sampling was done by accessible method according to the inclusion criteria. The sample size was estimated 272 students. In this study, in addition to examining the demographic characteristics, two standard questionnaires were used, which include: (a) ICT engagement questionnaire and (b) the online self-regulated learning questionnaire.

Statistical Analysis Used: Inferential statistics such as ANOVA, independent *t*-test, Pearson correlation coefficient, and univariate and multivariate linear regression were used.

Results: The results also showed that with multiple regression tests and Enter method, the ICT engagement, age, semesters 3, 5, and 6 and gender explain 30% of the variance of online self-regulated in nursing students.

Conclusion: In this study, the ICT engagement and online self-regulated had statistically significant relationship in nursing students and. So, for improving online self-regulated, it is recommended that the officials of nursing schools provide the facility and related to ICT engagement of students.

Keywords: E-learning, Engagement, Information and communications technology, Nursing students, Online learning, Self-regulated

Address for correspondence: Dr. Noushin Kohan, Department of Medical Education, Virtual University of Medical Sciences, Tehran, Iran.
E-mail: nu.kohan@gmail.com

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INTRODUCTION

Today, information and communications technology (ICT) has become an essential part of education. The use of technology in education and the learning process leads to progress and facilitates learning processes.[1] Due to the existence of the COVID-19 pandemic during the last two semesters in the world, the teaching and learning process, like academic management, is changing. The use of educational technology and electronic content can lead to the development of the quality of education, the expansion of learning opportunities, and the education.[2] ICT has brought about dramatic changes in all aspects of individual and collective life, so e-learning was created.[3] One of the principles of e-learning processes is independent learning. Therefore, it is necessary to train independent learners. That is, educational institutions should provide the opportunity for "independent" and effective learning by providing the necessary opportunities for interactions, and creating skills of "self-regulated" in learners.[4,5] Self-regulated has been introduced in the last 30 years to meet new needs related to learners' skills for more effective learning, is defined as an active process and processing structure by which the learner sets and controls her/his goals, learning activities, cognition, motivation, and behavior. Furthermore, Self-regulated is defined as the process in which learners identify their needs, formulate goals, search for resources by focusing on appropriate learning strategies, and evaluate learning outcomes on their own initiative, without guiding others or by guiding others.[4]

Numerous factors affect online self-regulated. One of these factors is student ICT engagement.[6] The term "engagement" was coined by Austin and literally means to get involved in something. It is usually defined as reluctance or reluctance to do something and is a sense of belonging and desire to engage in class activities.[7] Behavioral engagement includes student participation active in social groups, class relationships, University and home study, extracurricular activities related to the University, having positive behaviors, and not having destructive behaviors.[8] Changing the framework of computer-assisted learning and changing the expectations of a successful student in these environments doubles the importance of online self-regulated learning as a successful student.[9] According to the research results, the attitude toward e-learning and self-regulated had a positive and significant effect on academic achievement. Thus, students' positive attitude towards e-learning will help them to be more engaged in learning and applied more self-regulatory techniques in learning, and ultimately achieve more progress and success.[10]

Currently, the world medical Universities are severely engaged in the use of information technology due to the COVID-19 pandemic. Because Universities have held courses with e-learning, it seems necessary to examine the relationship between students' engagement with e-learning and online self-regulated them. Based on a review of the literature, some studies examined electronic self-regulated of learners and its related factors alone[11-14] and some others explained ICT engagement in the electronic environment alone.[15-19]

According to the available databases, no study has examined the relationship between these two variables in nursing students; therefore, this study was designed and conducted to determine the relationship between ICT engagement of nursing students with their online self-regulated in Mazandaran University of Medical Sciences. by better understanding the relationship of online self-regulated and ICT engaging in the electronic environment, faculty members and students could benefit from the results of this study, including students who could not fully adapt themselves to this change, and the newbie students who have just entered to the university environment and students who have studied with traditional education for many years.

MATERIALS AND METHODS

This research is a correlational study. The study population included all undergraduate nursing students in the 2nd to 6th semesters of Mazandaran University of Medical Sciences in three nursing schools of Sari, Amol, and Behshahr. The sampling was done by accessible method according to the inclusion criteria duration COVID-19 pandemic. Sampling was done from February 1, to March 3, 2021. All of the theoretical courses were held by virtual education and was used learning management systems online. The student 7th and 8th semester do not have any theoretical course so, did not enter this study. The first semester students did not enter the study due to a lack of familiarity with the University educational environment and e-learning.

The sample size was estimated based on a study results entitled studying the relation between self-directed learning and ICT literacy rate of students in e-learning courses of engineering sciences department in Mehr Alborz University.[20] The sample size was calculated 272 students; according to the following formula, standard deviation of ICT literacy = 5.9, the values of $\alpha = 0.05$ and $1-\beta = 0.80$.

$$n = \frac{\left[Z_{1-\frac{\alpha}{2}} + Z_{1-\beta} \right]^2 . s2}{[d]^2}$$

The inclusion criteria were having satisfaction from participating in the study and not having study leave in this semester and the previous semester. The exclusion criteria were not completing the questionnaires. Questionnaires were designed online and sent to students through social media groups and completed if desired.

In this study, in addition to examining the demographic characteristics, which included age, semester, gender, before grade average and total grade average, two standard questionnaires were used, which include: (a) ICT engagement questionnaire and (b) the online self-regulated learning questionnaire.

The first questionnaire includes ICT engagement questionnaire. It was first designed in 2015 by Zylka *et al*.[21] and then measured by students aged 16–18 in Baradaran Abdollahy *et al*. study in 2020 in Iran.[2] The questionnaire has 36 items. The questions have the 5-point Likert scale that is one to 5 points, very high, high, medium, low, and very low. This questionnaire has 7 factors. Factor 1 contains a positive self-concept in ICT and includes questions 4, 5,15,16,17,22,24,25,26,29,30,33,34; Factor 2 contains self-confidence in ICT and includes questions 2, 3, 8, 10, 11, 14; factor 3 contains online exposure and includes questions 23,24,36; Factor 4 contains social exposure and includes questions 6, 7, 12; factor 5 contains computers, tablets and mobile phones interest and includes questions 1,19,20,21; Factor 6 contains spending time in ICT and includes questions 18, 27, 32 and factor 7 contains negative ICT self-concept and includes questions 13, 31, 35. In the Persian version, question 9 has been deleted; therefore, the total score is in the range of 35–175.[2] The ICT engagement questionnaire was psychometrically evaluated by 18-year-old students in Iran in 2020 by Baradaran Abdollahy *et al*., and its reliability was based on Cronbach's alpha of 0.91. Validation of the questionnaire showed that the structures of ICT engagement in different countries due to cultural differences and the existence of unequal facilities and resources are different and it is suitable for use in Iran.[2] Hence, in this study, the Persian version of this questionnaire was used and Cronbach's alpha coefficient on 30 nursing student was 0.936.

The second questionnaire used in this study includes the 24-item online self-regulated learning questionnaire, which was first designed by Barnard *et al*. In 2009[22] and by Taghizade *et al*. in some Universities of Iran was validated on 418 graduate students.[5] The questions of this questionnaire in the 5-point Likert scale are one to 5 points; I strongly agree, agree, undecided, disagree, and strongly disagree. The questionnaire total score is in the range of 24–120. The exploratory factor analysis confirmed six factors, which included environmental structuring, goal setting, task strategies, time management, help-seeking, and self-evaluation. These factors have 4, 5, 4, 3, 4, and 4 questions, respectively. Environmental structuring (questions 1–4), goal setting (questions 5–9), task strategies (questions 10–13), time management (questions 14–16), help-seeking (questions 17–20), and self-evaluation (questions 21–24).[5] According to the validation of Taghizade *et al*. The results of this study showed that Cronbach's alpha coefficient was from 0.8 to 0.94. The intraclass correlation coefficient and Pearson correlation coefficient in the test–retest method were 0.77 and 0.78, respectively. Therefore, it was reported that this tool is suitable for evaluating online self-regulated learning in Iranian learners.[5] In this study, the Persian version of this questionnaire was used and Cronbach's alpha coefficient on 30 nursing students was 0.960.

After approving the proposal and code of ethics from the ethics committee of research affiliation to Virtual University of Medical Sciences (IR.VUMS.REC.1399.012), sampling was done. Data were analyzed after completing questionnaires. All data in the questionnaires were entered into IBM SPSS Statistics base 21.0 software (SPSS Inc., Chicago, IL) and analyzed. Descriptive statistics were used to show the demographic data and another variable by mentioning the number and percentage, mean and standard deviation. Inferential statistics such as ANOVA, independent *t*-test, Pearson correlation coefficient, and univariate and multivariate linear regression were used.

RESULTS

Two hundred and seventy-two undergraduate nursing students participated in this study and 118 (43.4%) were female and the rest were male. From the 2nd to the 6th semester, participation percentages were 21.3, 35.7, 5.1, 15.8, and 22.1, respectively. From Sari, Behshahr and Amol colleges, 47.1, 31.6 and 21.3% participated, respectively. Mean and standard deviation of age, previous semester grade average; total grade average, online self-regulated, and ICT engagement of nursing students are presented in Table 1. The average online self-regulated was at a good level and the average ICT engagement was at a high level.

The relationship between online self-regulated, ICT engagement, age, previous semester grade average, and total grade average of nursing students is presented in Table 2. The relationship between ICT engagement and online self-regulated was statistically significant. Also, the relationship of online self-regulated with the previous

semester grade average and the total grade average was statistically significant. Age had a significant inverse correlation with the previous semester grade average and total grade average ($P < 0.01$).

The relationship between online self-regulated and the gender of nursing students was not statistically significant ($t = 1.024$, $P = 0.289$) but the relationship between ICT engagement and the gender of nursing students was statistically significant ($t = 2.814$, $P = 0005$). The relationship between online self-regulated and nursing students 'semester with ANOVA test was not statistically significant ($f = 2.377$, $P = 0.052$) but the relationship between ICT engagement and nursing students' semester with ANOVA test was statistically significant ($f = 3.144$, $P = 0.015$).

The relationship between ICT engagement and online self-regulated based on univariate regression model was presented in Table 3. The regression model was selected by enter method and the model was suitable ($f = 77.95$, $P = 0.0001$). Adjusted R square 0.221 was obtained; That is, the ICT engagement rate explains 22.1% of the variance of online self-regulated in nursing students. Also, the value of the beta coefficient was estimated 0.437.

The relationship between ICT engagement and online self-regulated by multiple regression model was presented in Table 4. The regression model was selected by Enter method and the model was suitable ($f = 14.41$, $P = 0.000$). Adjusted R square 0.3 was obtained. That is, the ICT engagement, age, semesters 3, 5, and 6 and gender explain 30% of the variance of online self-regulated in nursing students. The highest standardized coefficients beta was related to ICT engagement (0.517).

DISCUSSION

The aim of this study was to determine the relationship between ICT engagements and online self-regulated in nursing student. The present study results show a significant direct correlation between ICT engagement and online self-regulated by Pearson correlation coefficient. like to the results of the present study, several studies have confirmed this relationship.[23,24] A similar study in language learners confirmed this relationship in language learning.[25] In another similar study, this significant relationship was reported on 580 lecturers of Nigeria University.[26]

The results of the present study showed that the relationship between ICT engagement and online self-regulated based on univariate regression test was significant. The ICT

Table 1: Mean and standard deviation of age, previous semester grade average, total grade average, online self-regulated, information and communications technology engagement of nursing students

Variable	Mean	SD
Age	21.12	1.722
Previous semester grade average (0-20)	16.48	0.859
Total grade average (0-20)	15.95	0.730
Online self-regulated	80.6360	20.42148
ICT engagement	107.2537	20.84307

SD: Standard deviation, ICT: Information and communications technology

Table 2: Relationship between information and communications technology engagement with online self-regulated, age, previous semester grade average, and the total grade average of all nursing students

Variable	Online self-regulated	ICT engagement
Online self-regulated	1	-
ICT engagement		
r	0.473**	1
P	0.000	
Age		
r	0.042	0.057
P	0.489	0.347
Previous semester grade average		
r	0.179**	0.024
P	0.003	0.700
Total grade average		
r	0.203**	0.072
P	0.001	0.239

**The level of statistically significant <0.01. ICT: Information and communications technology

Table 3: Relationship between information and communications technology engagement with online self-regulated by univariate regression model

	β	SE	Standardized coefficients beta	t	Significant
Constant coefficient	30.896	5.738		5.384	0.000
ICT engagement	0.464	0.053	0.473	8.829	0.000

SE: Standard error, ICT: Information and communications technology

engagement explained 22.1% of the variance of the online self-regulated in nursing students. In this regard, a study[27] aimed to investigate the relationship between the use of ICT skills and self-direction in learning on 200 graduate students of Islamic Azad University in the discipline of curriculum planning, financial management, law, Persian literature, animal sciences, and political sciences. The results show that 98% of the changes in self-directed learning can be explained by the components of ICT skills. The another study results showed that there is a positive significant correlation between all components of self-directed learning and ICT literacy and it was found that ICT literacy explains 0.45% of the variance of self-directed learning status.[20] These two studies[20,27] were performed on different discipline students with various questionnaires and in COVID-19 nonpandemic status. Therefore, the

Table 4: Relationship between information and communications technology engagement with online self-regulated by multiple regression model

	β	SE	Standardized coefficients beta	*t*	Significant
Constant coefficient	−76.395	33.464		−2.283	0.023
ICT engagement	0.507	0.052	0.517	9.826	0.000
Age	1.407	0.744	0.119	1.891	0.060
Gender	−7.757	2.188	−0.189	−3.546	0.000
Previous semester grade average	1.351	1.783	0.057	0.758	0.449
Total grade average	3.959	2.082	0.141	1.901	0.058
Semester 3	−9.817	2.999	−0.231	−3.274	0.001
Semester 4	−2.027	5.137	−0.022	−0.395	0.693
Semester 5	−14.403	3.540	−0.258	−4.069	0.000
Semester 6	−9.847	3.585	−0.200	−2.747	0.006

SE: Standard error, ICT: Information and communications technology

difference between two studies variance with the present study may be due to the above reasons.

In the present study, with Pearson correlation coefficient test, the online self-regulated was significantly related to the previous semester grade average and total grade average. In a similar study, the association online self-regulated with academic achievement on nursing students was statistically significant.[28] In other study entitled "comparing online and blended learner's self-regulated learning strategies and academic performance" the relationship self-regulated learning strategies and academic performance in e-learning compared to traditional learning statistically significant was reported.[29,30] However, in another study conducted on engineering students,[20] no significant relationship was observed between the online self-regulated and academic achievement that may be due to having the small sample size.

One of the advantages of computer-based learning is to be allow students to read programs at their own pace, so technology gives learners the opportunity to regulate and control their learning process. On the other hand, it is requiring that the learner be sufficiently enthusiastic, motivated, and self-regulated to be able to use technology tools effectively and efficiently.[31]

In the current study, the average ICT engagement was at a good level and the relationship between ICT engagement and the gender of nursing students was statistically significant. So that ICT engagement was more in boys than girls. In this regard, a study confirmed this relationship.[32] Contrary to the present study results, one study did not found a statistically significant relationship between ICT engagement and gender[33] and some studies reported more ICT engagement in women.[32,34] Therefore, it seems that more studies are needed in this issue.

In the current study, the mean of online self-regulated was at a good level and in multivariate regression showed

a significant relationship with ICT engagement, age, semesters 3, 5, and 6 and gender. Contrary to the present study, result one study[20] reported that there was no statistically significant relationship between age and online self-regulated. It may be due to participating postgraduate students in the study. Also, dissident to the current study results, online self-regulated was not significantly related to gender.[20,25,26] It seems that the reason for this difference in the preceding three studies with the present study can be related to the differences in the research community that were language learners,[25] teachers,[26] and students of engineering disciplines.[20]

The findings of the present study by multiple regression tests showed ICT engagement, age, semesters 3, 5, and 6 and gender 30% of the variance of online self-regulated explain in nursing students. Therefore, it seems that other factors can also play a role in online self-regulated of students. According to other articles, these factors could include e-learning acceptance,[28] motivation,[35,36] the presence of the supervising teacher and informed family members, the degree of interaction with the teacher, peers, and classmates[37,38] and the level of quality and facilities of learning management system.[39,40] Therefore, it is suggested that other researchers will consider these factors in future studies. There were the large number of questions in two questionnaires and it was an inevitable limitation of this study. It could decrease students' accuracy response. Also, non random sampling was another limitation.

CONCLUSION

In this study, the ICT engagement and online self-regulated had statistically significant relationship in nursing students. The multivariate regression test showed the highest standardized coefficients (beta) were related to ICT engagement. So, for improving online self-regulated, it is recommended that the officials of nursing schools provide the facilitates related to ICT engagement of students.

Conflicts of interest

There are no conflicts of interest.

Authors' contributions

MB-N; SA and NK developed the proposal and data collection. MB-N conducted data analysis and took responsibility for the initial manuscript. MB-N; SA and NK read and approved the final manuscript.

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