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Investigating the Effect of E-Learning with a Blended Approach on the Rate of Learning in Nursing Students during COVID-19 Pandemic

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A B S T R A C T

Introduction: Coronavirus 2019 (COVID-19) is a highly infectious disease. It has spread throughout the world in a short period and this widespread outbreak has caused many problems in medical institutions and universities. The purpose of this study was to investigate the effect of elearning with a blended visual, analytical, and practical approach on the rate of cognitive and psychomotor learning of the practical course of Nursing Principles and Skills in nursing students during the COVID-19 pandemic.

Methods: A quasi-experimental research design was used in this study. To conduct the research, 30 first-semester nursing students who had taken the course "Nursing Principles and Skills" were selected. The teacher divided the students into two groups of 15 students (experimental and control groups), and then before starting the practical class according to the faculty program, 8 virtual sessions in a blended form started for the experimental group.

Results: Before the intervention, the mean score of cognitive learning was equal to 4.66 ± 3.11 in the experimental group and 4.53 ± 2.94 in the control group. The mean score of psychomotor learning was equal to 0.86 ± 0.74 in the experimental group and 0.8 ± 0.86 in the control group. After the intervention, the mean scores of cognitive learning were equal to 16.89 ± 5.47 and 10.93 ± 4.55 in the experimental and control groups, respectively, while the mean scores of psychomotor learning were equal to 18.33 ± 3.85 and 12.46 ± 5.05 in the experimental and control groups, respectively.

Conclusion: During the COVID-19 pandemic, all human societies underwent unwanted changes. This pandemic caused damages to various economic, social, medical, and even educational institutions. The use of elearning with a blended approach can improve the rate of cognitive and psychomotor learning in medical students.

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Introduction

Coronavirus 2019 (COVID-19) is a highly infectious disease and its outbreak has been described as a global health emergency by the World Health Organization (WHO) [1]. This disease was first reported in Wuhan City, Hubei Province of China, in December 2019, and then spread throughout Hubei Province and other parts of this country [2]. COVID-19 emerged in Iran following the identification of the initial death linked to the virus on February 19, 2020, in Qom, a sacred city located in central Iran. Within а brief timeframe, COVID-19 rapidly disseminated throughout all provinces in the country [3]. There have been more than 7 million cases diagnosed with COVID-19 so far.

Coronavirus disease spread worldwide in a short period and this widespread outbreak caused many problems in medical institutions and universities. In addition, numerous rotations between universities and hospitals caused students to become potential victims of COVID-19. Therefore, the educational centers decided to hold some courses related to these students by elearning [1]. Following the onset of COVID-19 in March 2020, E-learning has been implemented across various educational levels in Iran and remains in practice to date. In response, medical science universities have endeavored to sustain educational activities by employing the Virtual University of Medical Sciences Navid System. Similarly, the Islamic Azad University has established a virtual education network to facilitate remote learning [4].

Replacing e-learning with traditional education can have a great impact on the quality of education. E-learning is the same as computerbased training which is one of the online learning technologies [5].

Distance e-learning is a way to hold educational courses, examine the development of students' knowledge, and evaluate their progress [6]. During the COVID-19 pandemic, holding practical courses through e-learning caused a lot of harm to students, especially undergraduate students [7]. The main problem in e-learning is the high use of lecture-based teaching methods. Before the COVID-19 pandemic, the lecture-based teaching method typically comprised 20% of practical classes [8]. The use of distance e-learning has caused practical learning experiences to decline and there has been a concern that these students may not be sufficiently proficient in practical lessons [9]. Fortunately, people use a variety of virtual tools in the present century, and a lot of information was exchanged via Twitter, WhatsApp, and Telegram before the COVID-19 pandemic [10-12]. In the COVID-19 pandemic, there has been a need for innovative solutions in addition to the given tools to optimize educational efforts. The present study aimed to investigate the effect of e-learning with a blended visual, analytical, and practical approach on the rate of cognitive and psychomotor learning of the practical course of Nursing Principles and Skills in nursing students.

Materials and Methods

A quasi-experimental research design was used in this study. To conduct the research, 30 firstsemester nursing students who had taken the course entitled: "Nursing Principles and Skills" were selected. For every 30 students, theoretical topics were first taught virtually under the four topics of wound care, medication administration, record keeping, and nutrition. At the end of these four sessions, the cognitive and psychomotor checklist was completed by the students. According to the decision of the education council of the faculty, the practical section of this course that included wound dressing, bandaging, drawing up medications, injections, preparing intravenous infusion set, report keeping in nursing, nasogastric intubation, and enema was held in four sessions instead of eight sessions due to COVID-19 pandemic conditions.

The teacher divided the students into two groups of 15 people (experimental and control groups), and then before starting the practical class according to the faculty program, 8 virtual sessions in a blended form started for the experimental group.

The intervention was implemented in this way that the teacher carried out practically the relevant topic in the practice room of the faculty, provided a video of this process, and shared it with students using Adobe Connect. Questions were asked of the students per ten minutes. At the end of the session, the teacher brought up a challenging issue related to the topic of the session, and the students were asked to have an online group discussion about it. After discussing and summing up, the students entered the Telegram group, the teacher determined homework for each student, and the student was asked to present the homework in the group by providing its video. In such topics as wound dressing, bandaging, drawing up medications, injections, and preparing intravenous infusion sets, the students were asked to prepare nursing reports. Using the simulation method, they should practice and film the relevant processes at home and send a video of their performance to the teacher. Reviewing the videos, the teacher corrected the shortcomings of the students. Finally, the teacher took an online exam related to the topic from the students. After a month, the students of both groups started their four face-toface sessions with the approval of the education council of the faculty. At the end of these four sessions, the cognitive and psychomotor learning checklist was completed by both experimental and control groups. The SPSS software was used to analyze data and the statistics of mean, relative standard deviation, frequency percentage, independent samples t-test, and paired sample t-test were measured.

Results and Discussion

The results obtained from the present study have been as follows. The mean age of participants was 18.73±0.71 and most participants in both groups were female students. To determine the rate of students' learning, three groups of scores were considered: The scores of 0 to 7 as the poor rate of learning, the scores of 7 to 14 as the moderate rate of learning, and the scores of 14 to 21 as the good and acceptable rate of learning (Table 1).

The mean score of cognitive learning before the intervention was equal to 4.66 ± 3.11 in the experimental group and 4.53 ± 2.94 in the control group. In addition, before the intervention, more than 50% of the participants in both the experimental and control groups got a score of 0 to 7 in the field of cognitive learning, indicating the poor rate of learning in both groups (Tables 1, 2, and 3).

Regarding psychomotor learning, the mean score before the intervention was equal to 0.86 ± 0.74 in the experimental group and 0.8 ± 0.86 in the control group, and 100% of the students got a score of 0 to 7, indicating the poor rate of learning. Of course, these scores were predictable considering that the participants were firstsemester nursing students at the undergraduate level and they only learned materials related to the cognitive domain in the theoretical classes and there was no training related to the psychomotor domain (Tables 1, 2, and 3).

After using a blended approach including visual cyberspace and the virtual participation of students, both groups of students were tested and evaluated at the end of three days of face-to-face training.

In the experimental group, the mean score of cognitive learning was equal to 16.86±5.47 and most participants (66.67%) got a score of 14 to 21, indicating that the use of e-learning with a blended approach caused to improve the rate of learning in the course of Nursing Principles and Skills (Tables 1 and 2).

In the control group, the mean score of cognitive learning was equal to 10.93±4.55 and most participants (60%) got a score of 7 to 14, indicating that the rate of learning in students was moderate when the traditional method of teaching was used during COVID-19 pandemic.

In the psychomotor domain, the mean score of the students in the experimental group was equal to 18.33±3.85 and most participants in this group (80%) got a score of 14-21. Since the number of face-to-face sessions was reduced from 16 to 3 during the COVID-19 pandemic, the students in

the experimental group could achieve a good rate of psychomotor learning with the help of the proposed e-learning method. Furthermore, in the psychomotor domain, the mean score of the students in the control group was equal to 12.46±5.05 and most participants in this group (53.34%) got a score of 7 to 14, indicating the moderate rate of learning in the control group.

According to the results, it is clear that the use of e-learning with a blended approach that includes e-learning along with virtual participation of students has a significant effect on the rate of learning in students and can largely compensate for educational shortcomings during the pandemic (Tables 1, 2, and 3).

Engum *et al.* [13] obtained the same results in their study. Investigating the mean difference between the scores of the two groups of traditional and online education, Wu *et al.* [14] found that there was a significant difference between the exam scores of students in a theoretical course. The results of their study showed that e-learning and the use of interactive videos had a great impact on a deep understanding of materials and promoting the knowledge due to the active involvement of students in the process of learning [14].

The study by Green *et al.* [15] also suggested that online learning could be used as a part of blended learning because of providing valuable opportunities for students to learn independently in a self-directed way.

In a study conducted by Reilly *et al.* [16] in line with previous studies, the results showed that nursing students valued the opportunity to perform practical nursing activities in a safe and secure environment before visiting the patients. They believed that the use of online teaching was a new method that could promote active learning, create great potential for the development of clinical skills, and increase students' selfconfidence. In this study, there was no statistically significant difference between the scores of the practical exam, as indicated by ASCII, and it was found that both traditional and online teaching methods played equally an important role in learning skills. Therefore, both methods can be used in teaching skills.

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Table 1: Average and standard deviation of age, cognitive and psychomotor learning before and after the
intervention in the experimental and control groups

Variables	Experimental	Control
	Mean ± SD	Mead ± SD
Age	18.73±0.71	18.6±0.63
Cognitive domain learning before intervention	4.66±3.11	4.53±2.94
Learn the psychological domain of movement before the intervention	0.86±0.74	0.8±0.86
Cognitive domain learning after intervention	16.86±5.47	10.93±4.55
Learning the psychological realm after the intervention	18.33±3.85	12.46 ± 5.05

Table 2: Absolute frequency, percentage of frequency, and relative sex, learning areas before and after the
intervention in experimental and control groups

Variables		Experimental	Control
Sex	Female	10 (66.7%)	11 (73.3%)
	Man	5 (33.3%)	4 (26.7%)
Cognitive domain learning before intervention	0-7	13 (86.66%)	14 (93.24%)
	7-14	2 (13.34%)	1 (6.6%)
	14-21	0 (0%)	0 (0%)
Psychomotor learning before intervention	0-7	15 (100%)	15 (100%)
	7-14	0	0
	14-21	0	0
Cognitive learning after intervention	0-7	1 (6.66%)	1 (6.66%)
	7-14	4 (26.7%)	9 (60%)
	14-21	10 (66.67%)	5 (33.34%)
Psychomotor learning after intervention	0-7	1 (6.67%)	3 (20%)
	7-14	2 (13.34%)	8 (53.34%)
	14-21	12 (80%)	4 (26.66%)

Table 3: Independent and paired T-test and control groups before and after the intervention

Independent-t before cognitive intervention between the experimental and control groups	0.121	0.9
Independent-t dimension of intervention in the cognitive domain between the experimental and control groups	3.22	0.003
Independent-t before intervention in the psychomotor domain in both experimental and control groups	0.227	0.8
Independent-t dimension of intervention in the field of motor psychomotor in the experimental and control groups	3.56	0.001
Paired-t before and after cohort intervention in the cognitive domain	-9.017	0.000
Paired-t before and after intervention in the experimental group in the field of motor psychology	-16.7	0.000
Paired-t before and after intervention in the control group in the cognitive domain	-6.25	0.000
Paired-t before and after intervention in the control group in the field of motor psychology	-9.83	0.000

However, it seems that the combination of them may help students to achieve more skills.

The research conducted by Yom [17] on the integration of Internet-based learning and traditional face-to-face learning in an RN-BSN nursing course, students were highly satisfied with the blended learning approach and the

majority of students demanded that most nursing courses be provided in this way.

Khazaei *et al.* [18] investigated the effect of educational software on learning practical skills of operating room students. The control group underwent traditional training of the practical skills and the experimental group learned them using traditional training along with designed

educational software. They concluded that educational software had a significant effect on students' scores and the learning of practical skills same as the results of our study.

Saeedinejat *et al.* [19] studied the impact of faceto-face and online teaching methods on learning theoretical courses in undergraduate health students. They found that the score of students in the online teaching group did not differ significantly from that of students in the face-toface teaching group. The researchers performed the study on a single group using a self-made questionnaire which can explain the difference from out study.

Tayyib *et al.* [20] have measured the nursing student satisfaction on blended e-learning at Umm Al-Qura University, Saudi Arabia. According to their study, the satisfaction levels of undergraduate nursing students were higher than average across all five domains of educational provision. Despite being exposed to an unfamiliar curriculum environment of blended e-learning, these students exhibited proficient technological skills, engaged in satisfactory interaction with both teachers and fellow students, and actively participated in the learning process.

Thisgaard *et al.* [21] studied the effects of virtual learning simulation and the traditional teaching method on the rate of cognitive learning. The results showed that virtual learning simulation was more efficient than the traditional method in enhancing cognitive and the knowledge of students in the virtual simulation group was more complete than those in the traditional teaching group. In a study by Betram *et al.* [22], it was concluded that e-learning was less motivating than conventional education. However, there was no difference between elearning and conventional education in terms of the rate of learning. Studying the extent to which students learned the fire safety behavioral skills, Cakiroglu et al. [23] found that students' fire safety behavioral skills significantly improved by training based on virtual reality and the majority of the students could transfer their behavioral skills to real environments. Simulation-based nursing education is considered as a pedagogical approach that has received increasing attention

[24]. Simulation as a teaching method includes activities that mimic the reality of a clinical environment and are designed to demonstrate procedures, decision making, and critical thinking through such techniques as role-playing and the use of such devices as interactive videos and mannequins [25]. Many countries, including Iran, have been affected by the COVID-19 pandemic. Currently, this pandemic has led to the cessation of clinical training for nursing trainees. Thus, colleges have turned to alternative methods of teaching students, such as e-learning and simulation, although there is no alternative to face-to-face contact with the patient. The results obtained from a meta-analysis indicated that training using simulation had a medium to high effect on the performance and psychomotor skills of nurses and senior nursing students, and the virtual simulation method was more effective than traditional teaching methods [26]. Finally, the results of the study conducted on nursing students who participated in a test in a simulated laboratory environment demonstrated that they felt safe and comfortable in such an environment that included no harm to the patients [27].

Conclusion

During the COVID-19 pandemic, all human societies underwent unintended changes which affected various economic, social, medical, and even educational institutions. From the first days of the outbreak of the pandemic, all educational centers in Iran were closed. Meanwhile, medical students suffered more damages because of the nature of their works. In the present study, it was tried to teach one of the nursing courses entitled: "Principles and Skills of Nursing" by e-learning with a blended approach that included online videos. online questions and answers. partnership in telegram groups, and virtual simulation. This method led to improved cognitive and psychomotor learning in nursing students so that a significant difference between the two experimental and control groups could be seen. It is recommended that this leaching method be used for other nursing and medical courses in future research.

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Authors' Contributions

All authors contributed to data analysis, drafting, and revising of the paper and agreed to be responsible for all the aspects of this work.

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