







# Evaluation of Virtual Education Experiences of Nursing Students: A Qualitative Study

Saiideh Norouzi <sup>1</sup>, Maliheh Javidpour <sup>2</sup>, Fariba Sharafi <sup>1</sup>, Zeinab Bahrami-Eyvanaki <sup>3,4,\*</sup>

<sup>1</sup> Department of Nursing, Abhar School of Nursing, Zanjan University of Medical Sciences, Zanjan, Iran

<sup>2</sup> Department of Nursing, Zanjan School of Nursing and Midwifery, Zanjan University of Medical Sciences, Zanjan, Iran

<sup>3</sup> Department of Nursing, Zanjan University of Medical Sciences, Zanjan, Iran

<sup>4</sup> Iran School of Nursing and Midwifery, Iran University of Medical Sciences, Tehran, Iran

\*Corresponding Author: Department of Nursing, Zanjan University of Medical Sciences, Zanjan, Iran. Email: zeinab.bahrami32@gmail.com

Received: 22 January, 2024; Revised: 9 September, 2024; Accepted: 16 September, 2024

## Abstract

**Background:** During the last two decades, especially during the COVID-19 pandemic, virtual teaching methods have been widely utilized in nursing education.

**Objectives:** To investigate the effectiveness of this method, this study was conducted to explore the experiences of nursing students regarding virtual education.

**Methods:** This qualitative study employed a content analysis approach at Zanjan University of Medical Sciences over two academic semesters in 1400. Purposeful sampling included 20 nursing students from various academic semesters, both male and female. Data collection was conducted through semi-structured and in-depth interviews. Conventional content analysis was used to analyze the interviews, and data analysis was performed manually.

**Results:** A total of 151 initial codes were extracted. After merging similar codes, 123 semantic units were ultimately organized into 21 subcategories and six main categories: Advantages and disadvantages, emotional reactions, teaching-learning process, responsibility and procrastination, motivation, and organizational factors related to virtual education based on the students' experiences.

**Conclusions:** Given the widespread use of virtual education, it is essential to identify the strengths, problems, and inhibiting factors associated with this type of education, especially in the training of medical students. Educational planners should strive to enhance the effectiveness of virtual education.

**Keywords:** Online Learning, Nursing Education, Student Perspectives

## 1. Background

The destructive nature of the COVID-19 pandemic has adversely affected all sectors of society, and higher education was no exception (1, 2). Throughout the pandemic, the education sector experienced significant disruptions globally, leading schools and universities to transition to distance learning (3).

Medical education, particularly, was held virtually for two main reasons. First, the health of students was at risk during clinical training, and second, infected students posed a potential source of transmission for hospitalized patients and the public (4). Consequently, nursing schools were compelled to shift their education

online, leading to the postponement of essential clinical activities (5, 6).

In recent decades, virtual teaching methods have gained significant attention in nursing education. However, the extensive use of these methods during the COVID-19 pandemic created unique opportunities and challenges. Among the advantages of online education are the implementation of innovative teaching strategies, accessibility of educational content, and increased flexibility. Nevertheless, challenges remain, including the lack of access to face-to-face clinical experiences, inadequate technology resources for both students and professors, quality control of online content, students' familiarity with the online learning

environment, and the availability of technological support (7, 8).

Nursing education relies on a combination of practical training and theoretical knowledge (9). Undergraduate students require face-to-face interaction with professors to grasp essential background knowledge (1), which is critical for developing the clinical skills and qualifications necessary for delivering quality patient care. On the other hand, following traditional face-to-face instruction, virtual education can enhance clinical skills, boost self-efficacy and confidence, improve overall competence, increase satisfaction, and reduce anxiety among students (9).

Given these factors, the effectiveness of virtual education in nursing remains uncertain. To ensure the competence and proficiency of graduates in this field, it is crucial to carefully examine the advantages and limitations of virtual education, identifying which courses are suitable for online delivery and which should be conducted in person (10). One valuable source of information in this context is the students themselves, who experienced extensive virtual training during the pandemic. Nursing students possess rich experiences that include not only theoretical coursework but also virtual clinical and practical training, yielding insights that can inform educational planning.

Most existing research in this field has utilized quantitative methods. However, an in-depth exploration of individuals' experiences through quantitative studies is limited, as statistics often fail to capture the full spectrum of reality, focusing primarily on the researcher's perspective. For instance, in Sheikhaboumasoudi's study, which assessed the improvement of nursing students' learning outcomes through a combination of traditional and electronic teaching methods, it was concluded that this hybrid approach could effectively enhance the clinical skills of nursing students (9).

## 2. Objectives

This study was conducted using a content analysis approach to explore nursing students' experiences with virtual education.

## 3. Methods

This research was a qualitative study conducted in 2021 at Zanjan University of Medical Sciences. The study population comprised nursing students from Zanjan University of Medical Sciences, and purposeful sampling was used so that the participants could offer the most

information. Sampling continued until data saturation was achieved. Saturation means repeating the obtained information and confirming those that have already been collected. Lastly, 20 nursing students who provided informed consent to participate in the study and had experience participating in virtual classes were included in the study. The chief method of data collection was semi-structured in-depth interviews. Before the start of the interview, the researcher clarified the voluntary nature of participating in the study, the option to leave the study if desired, and the confidentiality of the information. The main question of the interview was formulated based on a review of the texts and experts' opinions. The interview guide involved the following questions: Describe your experience of virtual education. What are your experiences regarding the advantages and disadvantages of virtual education? Describe your experience of learning practical lessons and internships virtually. Describe your experience of virtual evaluation. If required, probing questions were also used, such as: Please describe your experience more clearly. When the interviewee deviated from the main topic of the interview, the researcher drew his/her attention with questions such as, "Express this issue more clearly," and "Give me an example so that I understand what you mean." Some interviews were conducted face-to-face at the school or hospitals where the training units were held, and six interviews were conducted in the virtual space (WhatsApp) in the form of voice messages. The average duration of the interviews was 60 - 90 minutes. The interviews were recorded with the students' permission. After conducting each interview, all conversations were transcribed by the researcher with complete accuracy and verbatim, and were compared several times with the recorded interview. The data analysis and coding process started at the same time as the first interview. Conventional content analysis was used to analyze the interviews. Data analysis was done manually. Through a systematic classification process, in this method, codes and categories are extracted directly and inductively from the raw data. Accordingly, the codes were extracted based on the semantic units taken from the participants' descriptions and then classified based on the differences and similarities using the constant comparison technique. To confirm the rigor, trustworthiness, and credibility of the study, peer check and member check methods were used, and the results of data analysis and classification were approved by several professors. Likewise, the opinions of qualitative research method experts were used in the design of this study. For the member check, the analyzed results were given to numerous participants to approve the results,

and in the field of transferability, all the steps were explained in detail. In line with reliability and confirmation, an external observer with experience in qualitative research, according to the opinion of the research council of the university, was used to fully review and confirm the study implementation process. The phases of data collection and analysis were monitored.

#### 4. Results

The participants were 20 undergraduate nursing students (Table 1). A total of 151 codes were extracted. After merging similar codes, 123 semantic units were ultimately placed in 21 subcategories and 6 main categories, including advantages and disadvantages, emotional reactions, the teaching-learning process, responsibility and procrastination, motivation, and the organizational factors related to virtual education from the students' experiences (Tables 2 - 7).

**Table 1.** Demographic Characteristics of the Participants

Demographic Information	Count
<b>Age (y)</b>	
18 - 20	12
20 - 22	6
22 - 26	2
<b>Gender</b>	
Female	12
Male	8
<b>Father's education</b>	
Elementary to diploma	13
College education	7
<b>Mother's education</b>	
Elementary to diploma	9
College education	11
<b>Number of children in the family</b>	
2	6
2 - 4	14
<b>Income level (million tomans)</b>	
Under 10	8
Above 10	12

#### 5. Discussion

This study aimed to explain the experiences of nursing students at Zanjan University of Medical Sciences with virtual education. In the current research, participants' experiences were divided into six main categories, including advantages and disadvantages, emotional reactions, the teaching-learning process, responsibility and procrastination, motivation, and organizational factors.

##### 5.1. Advantages and Disadvantages

In the main category of advantages and disadvantages of virtual education, the categories of financial productivity, productive time management, learning promotion, physical harms, and inefficiency were extracted. In the present study, students stated that virtual education had reduced their current living expenses. The results of Mehrpouyan and Zakeri's study disclosed that e-learning eliminates the financial costs of attending classrooms (11), which aligns with the findings of the present study. Consequently, to save money for students, it is proposed that courses that can be held virtually should be offered as distance learning. The students specified that virtual education led to better time management, allowing them more time to study and pursue personal interests. The evidence disclosed that virtual education makes physical presence at a common time and place unnecessary and is permanently available (11, 12). Mehrpouyan and Zakari also indicated that virtual training allows busy students to utilize their extra hours for training (11). Rubinger et al. also stated that saving time and money is one of the advantages of online conferences (13). In the present study, students indicated that factors such as constant access to content, quality educational material, challenging homework design, and group study of courses had promoted their learning. Evidence shows that, despite the increase in students' workload, virtual education has helped them learn (14). The current study revealed that during virtual training, students became inactive and experienced physical complications such as headaches, and eye and ear pain. Physiological issues and laziness are among the most evident health problems of people participating in virtual education, which endanger their physical and mental health (15). Comparable results were obtained in the present study, which were caused by home quarantine and the long-term use of mobile phones and computers. To decrease these problems, it is recommended that essential training be provided to comply with the principles of ergonomics and that students also have proper planning for studying. On the other hand, professors can also help reduce these problems by uploading content that is suitable for the course unit. Consistent with the experiences of some students, virtual education was not sufficient. Mortazavi et al. also concluded that due to a lack of feedback, weak educational content, inadequate infrastructure, and communication problems, virtual education caused dissatisfaction among students (16), indicating the

**Table 2.** Main, Secondary Categories and Students' Experiences of the Benefits and Shortcomings of Virtual Education

Main Category	Sub-categories	Students' Experiences
Advantages and disadvantages	Financial efficiency	Student 3: "Decreasing the cost of commuting and accommodation benefited us".
		Student 8: "Because I'm a practical nurse, I used to pay for someone to cover my shift, but now I study and observe my shift".
	Productivity and time management	Student 5: "We used to be at university until 6 o'clock, but we have more time online. I was able to get my language degree".
		Student 11: "The only advantage was saving time so you don't have to go to university".
		Student 7: "Virtual education was very good for the paramedics. It saved our time".
	Learning promotion	Student 1: "Resources are always available".
		Student 2: "Learning is more than attending because if we don't understand something, we can go back and listen to the voice".
		Student 3: "Professors teach more prudently and confidently online".
		Student 6: "It made us look for learning and get some material from the internet".
		Student 7: "There were 4 of us taking notes, this increased our learning".
		Student 18: "This semester, one of the professors grouped us so that each group will design a test. The student must study well".
	Physical harms	Student 11: "Some of the professors have given good examples, the voice was also point-wise, and we could learn very well".
		Student 1: "Looking at the mobile phone and computer, my eyes and head hurt a lot".
		Student 9: "I was totally inactive during the Corona period".
	Inefficiency	Student 10: "My ears hurt because of using the hands-free".
Student 17: "Understanding a lesson like an anatomy was very difficult".		
Student 5: "We used to listen to the voices until the middle, it was interrupted and it would be played again from the beginning".		
Student 20: "It's not effective training at all and I don't think it was useful for anyone".		

**Table 3.** Main, Sub-category and Students' Experiences of Emotional Reactions to Virtual Education

Main Category	Sub-categories	Students' Experience
Emotional reactions	Pleasant	Student 2: "Because I had bad conditions in the dormitory when it was closed, I was happy that I could study in my virtual class away from the difficult conditions".
		Student 4: "By starting virtual education, I could reach my personal interests and I felt happy".
	Unpleasant	Student 5: "Virtual education did not feel good because we could not experience the atmosphere of the university".
		Student 10: "Offline teaching was not pleasant for us".
		Student 6: "The quality was not good at all and we were very stressed and we didn't learn anything and felt illiterate".
		Student 17: "We lost the intimate atmosphere of the university and entered a dry atmosphere. It was not a good experience and it got worse".
		Student 13: "I had doubts and worries about the resources not being uploaded on time, about the assignments? and about the evaluation?"

ineffectiveness of virtual education in the education and training of the nursing workforce.

**5.2. Emotional Reactions**

In the main category of emotional reactions, pleasant and unpleasant categories were extracted. In the current study, it was concluded that students experienced negative emotional reactions during the COVID-19 pandemic. Nursing students will be members of the multidisciplinary team in the future. Their mental health and well-being have a positive

relationship with job satisfaction, reduced turnover, and proper performance, and are considered an important component of health (17). Based on the study of Mulyadi et al., during the COVID-19 pandemic, the mental health of nursing students was threatened, and they suffered from depression, fear, anxiety, stress, and sleep disorders (18). Throughout the COVID-19 pandemic, depression among nursing students was caused by disruptions in study planning, limitations on students' activities, and sudden changes in learning methods (19). Evidence shows that depressive thoughts were caused by temporary restrictions on people's freedom, increased

**Table 4.** Main, Sub-categories and Students' Experiences of the Teaching-Learning Process of Virtual Education

Main Category	Sub-categories	Students' Experience
Teaching-learning process	Teaching method	Student 1: "The professor called the roll during the online class and asked questions, we had to pay attention to the lesson".
		Student 3: "None of our private lessons were held online, we had several online sessions of general lessons".
		Student 11: "A series of professors explained in simple language on the slide and then summarized the material". Student 17: "I listened with more interest to the lessons that the professor did not elaborate on too much".
	Educational content	Student 12: "One of our lessons, every session, was 2 hours of voice, we always had to write, it took up all our time, and we didn't even have time to read".
		Student 6: "A series of professors separated power point and voice, and in some cases, power and voice did not match".
		Student 20: "Because professors either introduced books or sent us files with a small size, general courses were not problematic".
		Student 15: "The professors who sent Voice and videos in addition to Power Pint were excellent, like anatomy showing the vertebrae".
	Interactions	Student 7: "We didn't interact with other students, except for a limited way in WhatsApp groups and chat section".
	Suitability of the educational environment with the nature of the course unit	Student 11: "We had limited communication with the professors".
		Student 13: "Communicating with the professor and receiving feedback was very good".
		Student 18: "Because the teaching was not face-to-face, the professor did not realize the vagueness of his explanation and could not establish effective communication".
		Student 1: "A smooth internship was held on WhatsApp, in the form of a voice call where we were talking to each other".
	Learning strategies	Student 3: "Because they were uploading a very large volume and we couldn't write all of them, we formed groups and shared our pamphlets".
		Student 15: "It was good for me, I learn better when I read".
		Student 8: "The crowd of children in the class made me not study, but my attention increased when I was alone".
		Student 6: "I listen and learn in class and I always have to ask questions, because of this, virtual education lowered my learning".
	Educational demands of students	Student 1: "In the online class, because there are more questions and answers compared to the offline class, even though it takes a lot of time, I learn better".
		Student 2: "For general courses, virtual has become much better, it is better to hold virtual education after Corona".
		Student 6: "I would have preferred our theory and internship classes to be face-to-face".
		Student 7: "It is better that the interval between teaching and presenting the assignment is neither too late nor too early, for example, a week is good".
Student 8: "We would like the access date of the courses to remain until the next semester".		
Student 11: "In virtual education, if the professor uses face-to-face teaching, video calls, and group formation, it can have a greater impact".		
Assessment	Student 20: "If it is possible, it is better to present the practical units that we passed virtually once again in person".	
	Student 1: "Virtual assessment is not accurate assessment".	
	Student 3: "We couldn't cheat in virtual education. Because the time for each question was very limited, except for a few questions where we remembered where was the question in the book".	
	Student 19: "In the first exam at the end of the semester, the Faradid system stopped after answering the first question. When I logged in again, it went from question 1 to question 5. I was very upset, and the next exams were also affected".	
	Student 10: "I didn't cheat and I was a top student, getting a score of 17 in the virtual exam was a wish for me".	
	Student 8: "In Faradid, 30 seconds was enough for one question, we needed to think for 50 seconds for one question, but the timing was the same for all questions, we couldn't go back, we couldn't see the next questions. When the timer turned red, my whole brain stopped".	
Virtual education platforms	Student 8: "We participated in our exams in groups".	
	Student 2: "It has good opportunities in different sections, but it is not suitable for exams".	
	Student 4: "To send a screenshot, we have to transfer the file to the laptop and send it from there, which is annoying".	
	Student 5: "We had a group assignment including 120 slides and a movie. The movie couldn't be loaded in the assignment section, so we had to divide the slides into 5 parts".	
	Student 10: "We only had an ECG workshop on the Adobe Connect platform, on the first day we had a lot of communication problems, on the second day it was good, but it didn't have the quality of face-to-face training".	

social distancing, social isolation, and spending too much time at home (20, 21). The findings of these studies are consistent with the present study. It seems that nursing students must learn coping skills, and professors should offer quality online education that

meets the students' needs while considering strategies to improve their mental health (22, 23). In the current study, the students who lived in difficult dormitory conditions and were far from their families felt satisfied that with virtual education, they could be present with

**Table 5.** Main, Sub-category and Students' Experiences of Responsibility and Procrastination in Virtual Education

Main Category	Sub-categories	Students' Experiences
Responsibility and procrastination	Professor	Student 4: "One of your professors Navid quizzes, we didn't have any problems at the end of the semester".
		Student 1: "Some professors used to load PowerPoints at the last minute or in a row".
		Student 6: "Most professors don't answer my messages".
		Student 11: "The professor had loaded a voice on the PowerPoint that was not related to the content of the PowerPoint".
		Student 16: "Some of the professors' explanation of their power point was very incomplete and it was only a title".
		Student 16: "Some professors have completely forgotten the students and do not visit the system at all".
		Student 18: "Some professors loaded a lesson plan, and we were confused about the evaluation method".
		Student 3: "I think the quality of the content that the professor has devoted more time to is much better".
	Student	Student 1: "I don't download a lot of content myself, I check the study mark, and I leave it for later".
		Student 6: "Homework is a way that now everyone takes it from each other and sends it".
		Student 7: "We didn't study anymore because we knew we could cheat".
		Student 12: "Learning completely depends on the student him or herself, when I read the virtual content well, I learned".

**Table 6.** Main, Sub-category and Students' Experiences of Motivation Regarding Virtual Education

Main Category	Sub-categories	Students' Experiences
Motivation	Motivating factors	Student 4: "The factor that increased my motivation was the feedback from several professors".
		Student 10: "Research work motivated me and I even asked the university several times to organize a workshop".
		Student 7: "Homework and taking exams, in general, made us study".
	Inhibiting factors	Student 2: "Sometimes I wanted to send an assignment, I saw that the file and the next assignment were loaded, the uploading of files made me tired and unmotivated".
		Student 3: "The amount of homework in some courses is very high, practically there is little time left for studying".
		Student 10: "We didn't have any desire to read the lessons that were only PowerPoint without voice and it was too much, except for the exam".
		Student 6: "Some professors did not give any feedback, which made us discouraged".
		Student 10: "I decided to prepare myself for the master's exam, but I completely lost my motivation in virtual education".

their families and pursue their interests. Consequently, it is proposed that in the educational planning of nursing students, the last days of the week should be dedicated to meeting with family and pursuing personal interests to restore mental energy.

### 5.3. Teaching-Learning Process

In the main category of the teaching-learning process, eight subcategories were extracted, including teaching methods, educational content, interactions, appropriateness of the educational environment with the nature of the course, learning strategies, students' educational demands, evaluation, and virtual education platforms. In this study, students expressed satisfaction with professors who summarized the material in simple language without elaborating too much, used multimedia content, refrained from sending bulky files without sound, and maintained interactions with the students. The education of students from various

medical science groups is of great importance because universities of medical sciences are the main providers of human resources for medical centers. Consequently, distinctive attention should be paid to the quality of their education. The evaluation of students' opinions serves as a criterion for assessing the quality of teaching and revealing educational weaknesses, leading to reforms in the educational process (24). In the current study, students indicated that holding virtual practical classes and internships was not only ineffective but also caused them to lose their skills. Since nursing students are trained to enter the health system of countries, they must also have basic training in critical conditions and be ready for challenging situations in the future. The experiences reveal that the use of appropriate alternative spaces, such as simulated clinical scenarios in the clinical education of students, has led to high satisfaction among students in the areas of initial clinical evaluations, diagnostic activities, and the

**Table 7.** Main, Sub-category and Students' Experiences of Organizational Factors of Virtual Education

Main Category	Sub-category	Students' Experiences
Organizational factors	Educational infrastructure	Student 8: "Throughout the exams, we entered the site late and our time was running out".
		Student 2: "The virtual infrastructure in our country has many problems. The internet speed for uploading assignments and exams was low and this made us anxious".
		Student 10: "Virtual education does not have the necessary efficiency, especially in our university, which does not have the necessary structure for online education".
		Student 11: "Internet costs were too high".
	Management factors	Student 1: "The officials of our university organized a series of virtual internships and practical lessons, in which we did not learn anything".
		Student 17: "Our university was very inexperienced in virtual education".
		Student 15: "Our university did not hold the classes even after completing the vaccination".
		Student 9: "There was no monitoring of the virtual educational content".
		Student 5: "Our university did not provide the necessary technical support for virtual education".

selection of appropriate treatment options (25). The presence of students in the clinical environment creates various learning opportunities. Monteparo et al. revealed that empathy training is a crucial component in the education of healthcare professionals, particularly during the coronavirus pandemic, because patients are scared and anxious during this time, and the use of empathy can alleviate fear and comfort patients in difficult conditions (26). Shorey and Debby Ng revealed that two major disadvantages of virtual worlds are technical issues and a lack of realism. Among the three outcomes of learning (skill-based, cognitive, and affective), the virtual world has the utmost impact on improving cognitive outcomes. Therefore, virtual education may be used as an alternative or complementary method for teaching theoretical knowledge in nursing education (27). Consequently, it can be concluded that practical courses and internships for nursing students should always be conducted face-to-face, and additional training must be provided to improve the quality of clinical care for patients, while theoretical training can be provided in a combined manner. The participants' experiences in the current study revealed that students with a self-directed learning strategy were more successful, and virtual education increased their learning. Sahebzadeh and Mehri's study also indicated that self-centered learning is effective when a person first feels the need to learn, then determines the goals of successful learning, and finally seeks help from means of communication, participation, and professor supervision to attain these goals (28). In the current study, students indicated that there were problems with virtual education platforms for submitting assignments and holding tests. Bdair also stated that students faced technical difficulties in dealing with the platforms during exams, which was a stressful experience. Instead, the presentation of

assignments was used for evaluation, and students perceived excessive assignments as a challenge (22). It seems that educational planners must provide appropriate infrastructure for virtual education, and professors must acquire skills in virtual education. In the present study, students complained about holding exams on the Faradid platform and the high possibility of cheating on exams and assignments. They also specified that it would be better to enhance the quality of the virtual exam platforms. Throughout the COVID-19 pandemic, all educational institutions shifted towards online education and assessment. Online tests have continuously been prone to violating scientific integrity. Since students tend to achieve the best results in both face-to-face and online exams, they may resort to unfair methods and commit academic violations (29). One of the difficulties of unprotected online exams, in comparison with oral or written exams, is the high rate of cheating. The Coms Forgas study revealed a high tendency to cheat in Spain during the COVID-19 period (29), which aligns with the findings of the present study. The lack of direct supervision during examinations poses a significant risk of academic misconduct. Consequently, to reduce the incidence of cheating, the questions should be designed such that their answers cannot be easily found through search engines and should require high cognitive levels so that students must think critically to answer within the given time (30) because the results obtained from the evaluation of students are crucial for their lives and careers, determining their economic and social status (31). In the current study, students specified that regarding the assignments that professors had assigned for evaluation, they occasionally failed and collaborated with peers to answer the questions. Accordingly, it seems that considering varied tasks suitable for the students' knowledge level that are simultaneously

challenging can encourage critical thinking and prevent this problem.

#### 5.4. Responsibility and Procrastination

In the main category of responsibility and procrastination, the subcategories of professor and learner were extracted. In the current study, it was found that students, due to the conditions that facilitated cheating in virtual exams, did not put in the necessary effort and perseverance in studying courses and completing assignments during virtual education, and they were negligent in this regard. Procrastination is the behavior of intentionally postponing the completion of academic assignments, even though it is expected to have negative consequences. Procrastination, which is observed among half of the students during their studies, correlates with mental health indicators, including life satisfaction, well-being, flexibility, and self-confidence, as well as with anxiety, depression, and stress (32). Jia et al., who investigated self-handicapping among medical students during COVID-19, indicated that self-handicapping has a direct relationship with academic anxiety and procrastination but an inverse relationship with academic motivation (33). Throughout the spread of COVID-19, the use of self-handicapping strategies was one factor affecting students' physical and mental health, which led to negative effects such as poor learning and lack of effort (34). Doğanülkü et al. investigated COVID and procrastination, stating that the fear of COVID has a direct and positive relationship with procrastination and intolerance of uncertainty. Furthermore, their study revealed that the inability to face uncertainty has a mediating role in the relationship between fear of COVID and procrastination (32). People who exhibit procrastinating behaviors face many problems in areas such as emotional regulation and adjustment, time management, and learning strategies. To prevent procrastination in nursing students and its negative consequences, it is necessary to include them in the teaching-learning process, as well as provide psychological support and services to the students, so that in addition to feeling valued, they can have a more active role in their learning process.

In the current study, it was found that, from the students' point of view, some professors were negligent, while on the other hand, some professors provided useful training to students due to their sense of responsibility. There is little evidence that professors may also suffer from procrastination (35). Laybourn et al. investigated procrastination, emotions, and stress among professors and revealed that more than half of the participants procrastinate in performing

administrative and organizational tasks, such as checking students' assignments. The results showed that professors delayed these tasks mainly because they disliked them. Furthermore, professors reported experiencing generally negative emotions when procrastinating, perceiving procrastination as a potential stressor in the teaching profession (35).

#### 5.5. Motivation

In the main category of motivation, the subcategories of encouraging and inhibiting factors were extracted. High motivation improves performance and increases students' academic success. Professors play a significant role in inspiring learners through teaching methods that actively involve students. In the present research, based on students' experiences, their participation in research activities and challenging assignments can improve motivation in virtual education. Based on the findings, in the category of inhibiting factors, students indicated that the uploading of a large volume of educational content in short intervals by professors, a large number of assignments, PowerPoints without voice, and lack of feedback were all inhibiting factors in virtual education. Mortazavi et al.'s study revealed that one of the inhibiting factors in virtual education was the lack of feedback and the weakness of the educational content, highlighting the need for monitoring by the educational development center and improvement in the infrastructure of virtual education (16). Evidence shows that the absence of support staff and lack of sufficient support, weak internet connections, and poor audio quality of the instructor were the main inhibiting factors in virtual education (36, 37).

#### 5.6. Organizational Factors

In the main category of organizational factors, the subcategories of educational infrastructure and management factors were extracted. Based on students' comments, there was no appropriate internet infrastructure for virtual education, and they were dissatisfied that most virtual classes were held offline. Evidence suggests that accessibility and affordability of virtual education infrastructures for learners of different economic levels remain challenging (38). Ayazi and Ahmadi indicated that, at the beginning of virtual education, because of the novelty of virtual teaching methods and the low speed of the internet, students did not pay attention to virtual classes. However, the number of students in online courses increased with improvements in internet speed and bandwidth (39). Ahmady et al. also disclosed that the most significant



challenges of virtual learning are the lack of facilities and issues such as insufficient high-speed internet, smartphones, and an unsuitable platform for virtual learning (40), and the present study confirms these results. To better facilitate the process of virtual education in the future, educational managers should be familiar with new methods of education and possess the necessary authority to implement and monitor its correct application.

### 5.7. Conclusions

Over time, and with advancements in technology, virtual education will become an integral part of student education, particularly in medical sciences. Consequently, it can be concluded that the problems and factors inhibiting this method of education such as technical difficulties, lack of interaction, or challenges in assessment methods must be addressed, and practical solutions should be implemented to mitigate these weaknesses. Simultaneously, its strengths should be highlighted, and efforts should be made to enhance them, so virtual education can be implemented as effectively as face-to-face education and used to improve the learning outcomes of medical students, especially in nursing.

### 5.8. Highlight

Considering that nursing education is a combination of theoretical, practical and clinical education, the exploration of the experiences of students in this field provides rich information about the applicability of virtual education in medical sciences; In addition, the findings of the present study can be a starting point for future research in the field of nursing education.

### 5.9. Lay Summary

In recent decades, virtual education in the field of nursing has received a lot of attention. The current qualitative study, with the qualitative content analysis approach, to investigate the effectiveness of this method of education, explore the experiences of nursing students from virtual education. The experiences of students were placed in 6 main categories including advantages and disadvantages, emotional reaction, teaching-learning process, responsibility and procrastination, motivation and organizational factor related to virtual education. Educational planners are expected to use the findings of this study to improve the quality of virtual education.

## Acknowledgements

The authors appreciate all the participants of this research.

## Footnotes

**Authors' Contribution:** Z. B. and S. N.: Wrote the first draft; Z. B., S. N., and M. J.: Analyzed the data and wrote the manuscript; S. S.: Review of the manuscript.

**Conflict of Interests Statement:** The authors declare that there is no conflict of interest. The authors declare that AI-based tools have not been used in the research and preparation of this manuscript.

**Data Availability:** The dataset of this study is available on request from the corresponding author.

**Ethical Approval:** IR.ZUMS.REC.1399.311 .

**Funding/Support:** This article was Supported by Zanjan University University of Medical Sciences.

**Informed Consent:** Informed consent was obtained from the participants.

## References

1. Finlay MJ, Tinnion DJ, Simpson T. A virtual versus blended learning approach to higher education during the COVID-19 pandemic: The experiences of a sport and exercise science student cohort. *J Hosp Leis Sport Tour Educ.* 2022;**30**:100363. [PubMed ID: 34867086]. [PubMed Central ID: PMC8629382]. <https://doi.org/10.1016/j.jhlste.2021.100363>.
2. Singh R, Baby B, Singh R, Suri A. Role of virtual modules to supplement neurosurgery education during COVID-19. *J Clin Neurosci.* 2021;**91**:125-30. [PubMed ID: 34373016]. [PubMed Central ID: PMC8782259]. <https://doi.org/10.1016/j.jocn.2021.06.039>.
3. Masha'al D, Rababa M, Shahrour G. Distance Learning-Related Stress Among Undergraduate Nursing Students During the COVID-19 Pandemic. *J Nurs Educ.* 2020;**59**(12):666-74. [PubMed ID: 33253395]. <https://doi.org/10.3928/01484834-20201118-03>.
4. Sahi PK, Mishra D, Singh T. Medical Education Amid the COVID-19 Pandemic. *Indian Pediatr.* 2020;**57**(7):652-7. [PubMed ID: 32412913]. [PubMed Central ID: PMC7387262]. <https://doi.org/10.1007/s13312-020-1894-7>.
5. Ramos-Morcillo AJ, Leal-Costa C, Moral-Garcia JE, Ruzafa-Martinez M. Experiences of Nursing Students during the Abrupt Change from Face-to-Face to e-Learning Education during the First Month of Confinement Due to COVID-19 in Spain. *Int J Environ Res Public Health.* 2020;**17**(15). [PubMed ID: 32751660]. [PubMed Central ID: PMC7432480]. <https://doi.org/10.3390/ijerph17155519>.
6. Guven Ozdemir N, Sonmez M. The relationship between nursing students' technology addiction levels and attitudes toward e-learning during the COVID-19 pandemic: A cross-sectional study. *Perspect Psychiatr Care.* 2021;**57**(3):1442-8. [PubMed ID: 33305866]. <https://doi.org/10.1111/ppc.12710>.
7. Bourgault A, Mayerson E, Nai M, Orsini-Garry A, Alexander IM. Implications of the COVID-19 pandemic: Virtual nursing education for delirium care. *J Prof Nurs.* 2022;**38**:54-64. [PubMed ID: 35042590]. [PubMed Central ID: PMC8654606]. <https://doi.org/10.1016/j.profnurs.2021.11.012>.

8. Dhawan S. Online Learning: A Panacea in the Time of COVID-19 Crisis. *J Edu Tech Sys.* 2020;**49**(1):5-22. <https://doi.org/10.1177/0047239520934018>.
9. Sheikhaboumasoudi R, Bagheri M, Hosseini SA, Ashouri E, Elahi N. Improving Nursing Students' Learning Outcomes in Fundamentals of Nursing Course through Combination of Traditional and e-Learning Methods. *Iran J Nurs Midwifery Res.* 2018;**23**(3):217-21. [PubMed ID: 29861761]. [PubMed Central ID: PMC5954644]. [https://doi.org/10.4103/ijnmr.IJNMR\\_79\\_17](https://doi.org/10.4103/ijnmr.IJNMR_79_17).
10. Bartoletta JJ, Hinchcliff K, Rhee P. Learner Preferences and Perceptions of Virtual Hand Surgery Education During the COVID-19 Pandemic. *J Hand Surg Am.* 2023;**48**(4):405 et-8. [PubMed ID: 35033403]. [PubMed Central ID: PMC8705619]. <https://doi.org/10.1016/j.jhsa.2021.11.009>.
11. Mehrpouyan A, Zakeri E. Virtual Education in English Literature Courses during Pandemic COVID-19: Merits and Demerits, and Needs. *J Critic Stud Lang Lit.* 2021;**3**(1):41-6. <https://doi.org/10.46809/jcsll.v3i1.125>.
12. Pei L, Wu H. Does online learning work better than offline learning in undergraduate medical education? A systematic review and meta-analysis. *Med Educ Online.* 2019;**24**(1):1666538. [PubMed ID: 31526248]. [PubMed Central ID: PMC6758693]. <https://doi.org/10.1080/10872981.2019.1666538>.
13. Rubinger L, Gazendam A, Ekhtiari S, Nucci N, Payne A, Johal H, et al. Maximizing virtual meetings and conferences: a review of best practices. *Int Orthop.* 2020;**44**(8):1461-6. [PubMed ID: 32445031]. [PubMed Central ID: PMC7244398]. <https://doi.org/10.1007/s00264-020-04615-9>.
14. Matuk C, Martin R, Vasudevan V, Burgas K, Chaloner K, Davidesco I, et al. Students Learning About Science by Investigating an Unfolding Pandemic. *AERA Open.* 2021;**7**. <https://doi.org/10.1177/23328584211054850>.
15. Abbasi Dare Bidi A, Ebrahimi A. [Challenges and opportunities of virtual education from the perspective of Shiraz teachers in the Corona era]. *J New Develop Psychol Edu Sci Edu.* 2021;**4**(2):1-11. FA.
16. Mortazavi F, Salehabadi R, Sharifzadeh M, Ghardashi F. Students' perspectives on the virtual teaching challenges in the COVID-19 pandemic: A qualitative study. *J Educ Health Promot.* 2021;**10**:59. [PubMed ID: 34084806]. [PubMed Central ID: PMC8057160]. [https://doi.org/10.4103/jehp.jehp\\_861\\_20](https://doi.org/10.4103/jehp.jehp_861_20).
17. Richardson GE, Gillespie CS, Mantle O, Clynch A, Ooi SZY, Park JJ, et al. Social and psychological impact of the COVID-19 pandemic on UK medical and nursing students: protocol for a national medical and nursing student survey. *BMJ Open.* 2022;**12**(5). e057467. [PubMed ID: 35523504]. [PubMed Central ID: PMC9082730]. <https://doi.org/10.1136/bmjopen-2021-057467>.
18. Mulyadi M, Tonapa SI, Luneto S, Lin WT, Lee BO. Prevalence of mental health problems and sleep disturbances in nursing students during the COVID-19 pandemic: A systematic review and meta-analysis. *Nurse Educ Pract.* 2021;**57**:103228. [PubMed ID: 34653783]. [PubMed Central ID: PMC8496961]. <https://doi.org/10.1016/j.nepr.2021.103228>.
19. Zhu Y, Wang H, Wang A. An evaluation of mental health and emotion regulation experienced by undergraduate nursing students in China during the COVID-19 pandemic: A cross-sectional study. *Int J Ment Health Nurs.* 2021;**30**(5):1160-9. [PubMed ID: 33848056]. [PubMed Central ID: PMC8250684]. <https://doi.org/10.1111/inm.12867>.
20. Kalkan Ugurlu Y, Mataraci Degirmenci D, Durgun H, Gok Ugur H. The examination of the relationship between nursing students' depression, anxiety and stress levels and restrictive, emotional, and external eating behaviors in COVID-19 social isolation process. *Perspect Psychiatr Care.* 2021;**57**(2):507-16. [PubMed ID: 33270226]. [PubMed Central ID: PMC7753737]. <https://doi.org/10.1111/ppc.12703>.
21. Qiu J, Shen B, Zhao M, Wang Z, Xie B, Xu Y. A nationwide survey of psychological distress among Chinese people in the COVID-19 epidemic: implications and policy recommendations. *Gen Psychiatr.* 2020;**33**(2). e100213. [PubMed ID: 32215365]. [PubMed Central ID: PMC7061893]. <https://doi.org/10.1136/gpsych-2020-100213>.
22. Bdaire IA. Nursing students' and faculty members' perspectives about online learning during COVID-19 pandemic: A qualitative study. *Teach Learn Nurs J.* 2021;**16**(3):220-6. <https://doi.org/10.1016/j.teln.2021.02.008>.
23. Li W, Gillies R, He M, Wu C, Liu S, Gong Z, et al. Barriers and facilitators to online medical and nursing education during the COVID-19 pandemic: perspectives from international students from low- and middle-income countries and their teaching staff. *Hum Resour Health.* 2021;**19**(1):64. [PubMed ID: 33980228]. [PubMed Central ID: PMC8114664]. <https://doi.org/10.1186/s12960-021-00609-9>.
24. Farsi Z, Ahmadi Y, Afaghi E, Sajadi SA. [Satisfaction of the Quality of Education and Virtual Education during the Covid-19 Pandemic in Nursing Students of Aja University of Medical Sciences in 2020]. *J Military Med.* 2022;**23**(2):174-85. FA. <https://doi.org/10.30491/jmm.23.2.174>.
25. Mehrdad SM, Dadgaran I, Taheri Ezbarimi Z, Taheri M, Asgari F, Akhondzadeh L. The Necessity of Move Towards Virtual Clinical Teaching in the COVID 19 Pandemic: Introducing the SAID Model for Clinical Teaching of Endocrine Diseases by Webisode Teaching Method. *Res Med Edu.* 2020;**12**(4):1-4. <https://doi.org/10.52547/rme.12.4.1>.
26. Monteparo I, Thompson K, Choe E, Wang A, Kohanzad S, Thapar K, et al. "No Hard Feelings": Empathy Training for Nuclear Medicine Technologists: A Review and Methods of Improvement During the COVID-19 Pandemic. *J Nucl Med.* 2021;**62**.
27. Shorey S, Ng ED. The use of virtual reality simulation among nursing students and registered nurses: A systematic review. *Nurse Educ Today.* 2021;**98**:104662. [PubMed ID: 33203545]. <https://doi.org/10.1016/j.nedt.2020.104662>.
28. Sahebzadeh M, Mehri M. [Higher education and review of self-directed learning methods in virtual education]. *Horiz Med Edu Develop.* 2021;**12**(3):97-112. FA. <https://doi.org/10.22038/hmed.2020.53747.1110>.
29. Comas-Forgas R, Lancaster T, Calvo-Sastre A, Sureda-Negre J. Exam cheating and academic integrity breaches during the COVID-19 pandemic: An analysis of internet search activity in Spain. *Heliyon.* 2021;**7**(10). e08233. [PubMed ID: 34722942]. [PubMed Central ID: PMC8539823]. <https://doi.org/10.1016/j.heliyon.2021.e08233>.
30. Komosny D, Rehman SU. A Method for Cheating Indication in Unproctored On-Line Exams. *Sensors (Basel).* 2022;**22**(2). [PubMed ID: 35062615]. [PubMed Central ID: PMC8778460]. <https://doi.org/10.3390/s22020654>.
31. Fontaine S, Frenette E, Hébert M. Exam cheating among Quebec's preservice teachers: the influencing factors. *Int J Edu Integrity.* 2020;**16**(1):14. <https://doi.org/10.1007/s40979-020-00062-6>.
32. Doğanülkü HA, Korkmaz O, Griffiths MD, Pakpour AH. Fear of COVID-19 lead to procrastination among Turkish university students: The mediating role of intolerance of uncertainty. *BMC Psychol.* 2021;**9**(1). <https://doi.org/10.1186/s40359-021-00681-9>.
33. Jia J, Wang LL, Xu JB, Lin XH, Zhang B, Jiang Q. Self-Handicapping in Chinese Medical Students During the COVID-19 Pandemic: The Role of Academic Anxiety, Procrastination and Hardiness. *Front Psychol.* 2021;**12**:741821. [PubMed ID: 34603160]. [PubMed Central ID: PMC8484870]. <https://doi.org/10.3389/fpsyg.2021.741821>.
34. Zarshenas L, Jahromi LA, Jahromi MF, Manshadi MD. Self-handicapping among nursing students: an interventional study. *BMC Med Educ.* 2019;**19**(1):26. [PubMed ID: 30929643]. [PubMed Central ID: PMC6442433]. <https://doi.org/10.1186/s12909-018-1441-6>.
35. Laybourn S, Frenzel AC, Fenzl T. Teacher Procrastination, Emotions, and Stress: A Qualitative Study. *Front Psychol.* 2019;**10**:2325. [PubMed

- ID: 31681115]. [PubMed Central ID: PMC6798067]. <https://doi.org/10.3389/fpsyg.2019.02325>.
36. Abuhammad S. Barriers to distance learning during the COVID-19 outbreak: A qualitative review from parents' perspective. *Heliyon*. 2020;**6**(11). e05482. [PubMed ID: 33200106]. [PubMed Central ID: PMC7654229]. <https://doi.org/10.1016/j.heliyon.2020.e05482>.
37. Gupta S, Dabas A, Swarnim S, Mishra D. Medical education during COVID-19 associated lockdown: Faculty and students' perspective. *Med J Armed Forces India*. 2021;**77**(Suppl 1):S79-84. [PubMed ID: 33612936]. [PubMed Central ID: PMC7873682]. <https://doi.org/10.1016/j.mjafi.2020.12.008>.
38. Pokhrel S, Chhetri R. A Literature Review on Impact of COVID-19 Pandemic on Teaching and Learning. *High Edu Future*. 2021;**8**(1):133-41. <https://doi.org/10.1177/2347631120983481>.
39. Ayazi Z, Ahmady S. Managerial Analysis and Explaining the Viewpoints of the Students on Virtual Education During the COVID-19 Pandemic at the Virtual School of Medical Education and Management of Shahid Beheshti University of Medical Sciences in 2020. *Strides Develop Med Edu*. 2020;**17**(Supplement):1-8.
40. Ahmady S, Shahbazi S, Heidari M. Transition to Virtual Learning During the Coronavirus Disease-2019 Crisis in Iran: Opportunity Or Challenge? *Disaster Med Public Health Prep*. 2020;**14**(3):e11-2. [PubMed ID: 32375914]. [PubMed Central ID: PMC7264447]. <https://doi.org/10.1017/dmp.2020.142>.