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The effects of e-learning using educational multimedia on the ethical decision-making and professionalism of nursing students during the COVID-19 pandemic: a quasi-experimental study

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Abstract

Background The COVID-19 pandemic has created a great challenge for educational systems worldwide. During this time, educational centers have been encouraged to use e-learning programs to protect the population against infection. Online teaching has the greatest effect on the process of teaching-learning for certain topics, including professional behavior and commitment, which has prompted educational systems to use creative strategies for a greater effect on learners. The present study aims to determine the effects of e-learning using educational multimedia on the ethical decision-making and professionalism of nursing students during the COVID-19 pandemic.

Methods This study was conducted using a quasi-experimental design with a control group. The statistical population comprised second-semester nursing students in a first-rank nursing school in north western Iran. The samples were selected using simple random sampling and were divided into experimental ($n=40$) and control ($n=40$) groups. In the first stage of teaching, the conventional training method of the COVID-19 pandemic was used in both groups. In the second stage of teaching, an in-person workshop was organized for the control group and an e-learning workshop using educational multimedia for the experimental group. Data were collected by a tool with three parts: Demographic information, the Nursing Dilemma Test (NDT) by Crisham based on the Nurse Principled Thinking, and the Nursing Students Professional Behaviors Scale (NSPBS) designed by Goz. Data were analyzed in SPSS 25 software.

Results There was a statistically significant increase in the post-test mean score of professionalism (125.70 ± 6.20 vs. 120.95 ± 9.28) and ethical decision-making (46.17 ± 3.81 vs. 44.02 ± 3.21) in the experimental group compared to the control group ($P < 0.05$).

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Conclusion The learning environment affects learning, and e-learning using educational multimedia has a greater impact than in-person workshops on improved learning outcomes with regard to ethical decision-making and professionalism.

Keywords Professional behavior, Professionalism, COVID-19, Nursing, E-learning, Nursing dilemma

Introduction

The advances in science and technology and the complexities of healthcare environments create certain hurdles in the provision of ethical care. Nurses bear responsibility for identifying, preventing, and resolving these ethical challenges. An appropriate curriculum structure is required to develop professionalism in nursing. Graduates, postgraduates, and doctors of nursing practice tend to not have adequate knowledge and skills in the ethical principles required to overcome the obstacles in ethical practice. To a certain extent, this inadequacy is due to the lack of an educational content on professionalism in nursing ethics curricula [1]. The learning environment must create the appropriate circumstances for nursing students to acquire professional competence, clinical reasoning, and ethical decision-making to prepare them as professional nurses ready to serve their communities. This issue becomes far more sensitive at times of unexpected public health emergencies, such as the COVID-19 pandemic, because nurses might be faced with increasingly complex ethical dilemmas under such circumstances [2]. The proper management of these ethical challenges and dilemmas when providing care to patients requires the correct understanding of the principles of professional and directing the ethical decision-making process [2]. Ethical decision-making is a logical process leading to optimal ethical decisions made through systemic reasoning in situations of contradictory choices [3]. Failure at this stage means unprofessionalism toward the patients and inadequate care for them [4]. Professionalism is defined as the possession of skills and measures reflecting the habits, attitudes, beliefs, and values defined by the profession [5]. Hence, nursing students must be informed about professional behaviors and ethical theories, since knowing the ethical codes, principles, and standards required for moral reasoning and ethical decision-making in order to select and provide the best interventions for patients and their families is crucial when dealing with particular moral situations [6–8].

Technological advances offer a range of methods to teach professionalism [7]. When the educational context has poor resources and facilities for teaching-learning activities, learning must take place in the real environment [9]. In one study, Rajeswara et al. (2016) showed that nursing students were unable to correctly apply their theoretical learnings in clinical practice, leading to low-quality clinical and professional performance [10]. Thus, the existing gap in knowledge transfer from

the theoretical classroom to clinical practice indicates the need to develop more effective teaching programs [11, 12]. Moreover, people have different learning styles. Therefore, teaching programs must be sufficiently flexible and varied to cover these different learning styles [13]. A study by Chao (2017) conducted to design and implement e-learning courses on ethics and assess their effects showed that students of experimental sciences were better able to judge the advantages and disadvantages of strategies and reflect on actions taken when making ethical decisions during the course of their training [7]. New computer technologies in today's digital era have sparked the interest of professors in multimedia communication methods. The ease of use of multimedia technology and the opportunity to display images, animations, and videos and combine sound and text have made this method an essential part of e-learning technologies [14]. Multimedia learning promotes flexibility in learning and encourages self-directed learning and taking self-responsibility toward learning [15]. It enables direct understanding and proper transfer of content [16]. Although several problem-based, medical ethics, refresher courses have already been held for graduates and specialists, the teaching methods pursued in universities have not yet been modified accordingly. Meanwhile, teaching ethics must be in unison with the overall curriculum and apply a range of learning aids, including computers, educational software, etc [7, 17].

Research has demonstrated the positive outcomes of learning using new teaching methods through the improved ethical decision-making and professionalism observed in learners. Studies have also demonstrated a certain lack of ethical decision-making skills and professionalism in nurses, mostly as a result of educational shortfalls in ethical subjects. According to these studies, appropriate training methods and strategies to teach ethical conduct and professionalism are often lacking in many academic centres where ethical training is currently not given at the required quality and nurses do not feel competent in ethical skills. Therefore, considering the importance of courses in medical ethics, deepening the students' learning, the essential role of learning styles and teaching methods for the professional empowerment of nurses, the impossibility of holding in-person classes during the COVID-19 pandemic, and the global impact of the pandemic on the traditional education system, making e-learning an essential part of medical and nursing training, the present study aims of determining

the Effects of E-learning Using Educational Multimedia on the Ethical Decision-making and Professionalism of nursing students during the COVID-19 pandemic.

Methodology

Aim of the study

This is a quasi-experimental study with a control group aiming to determine the effectiveness of e-learning on the principles of professionalism using educational multimedia in the ethical decision-making and professionalism of nursing students.

The study was conducted in three phases.

First phase: sample selection, entry, and exit criteria, and pre-test implementation

The statistical population comprised second-semester nursing students in a first-rank in Nursing School of Tabriz-northwestern Iran in 2021. The Tabriz School of Nursing and Midwifery, established in 1917, was Iran's first nursing education institution. Initially founded as a scientific center affiliated with the Mishan Hospital in America, it played a crucial role in training nursing students until 1350 (1971), when it merged with the University of Tabriz. In 1966, the midwifery program was also established, providing education to students in the field of midwifery.

Currently, the school has 650 undergraduate students across three specializations: nursing, midwifery, and operating room technicians. Additionally, there are 298 master's students in seven different nursing specializations, including medical-surgical nursing, pediatric nursing, psychiatric nursing, community health nursing, and neonatal nursing. Furthermore, 28 Ph.D. students are pursuing their studies in nursing at this institution.

In the Iranian nursing undergraduate program, the professional ethics course contributes one unit, divided into 0.5 units of practical training and 0.5 units of theoretical instruction.

The inclusion criteria were: Enrolment in the second semester of an MSc program in nursing at the Faculty of Nursing and Midwifery of Tabriz University of Medical Sciences and having completed the course on nursing concepts, principles and techniques. The participants who had completed more than one questionnaire or had returned incomplete questionnaires (i.e., responding to less than 75% of the items) were excluded from the study.

The total number of second-semester students was one hundred. The required sample size was calculated by considering an 80% power and a significance level of 0.05 using GPOWER software. Based on the results of Khalili et al.'s study, the sample size was determined to be 40 people in each group [18]. The samples were randomly selected and assigned to two groups: an experimental

group and a control group. Utilizing the Random.org stratified random website, the ratio is one to one.

According to the curriculum, nursing students must complete a course on nursing ethics and professional communication in the second semester of their school before gradually easing their way into the clinical learning environment. Nursing students at Tabriz University of Medical Sciences learn nursing ethics and professional communication and acquire experience in them as a longitudinal theme during their 4-year degree program by participating in clinical training, workshops, and seminars held on professional ethics and behaviors and techniques for ethical interactions and communication with members of the health team, patients/clients, and their families.

In the present study, once the participants were selected based on the inclusion/exclusion criteria, the researcher initially explained the objectives and methodology of the study to the eligible students on WhatsApp and obtained their free, voluntary, and informed consent to participate in the study in an online format. The participants were also briefed on answering the pre-test questions and submitting the responses, the confidentiality of the collected data, and the freedom to leave the study at any given time. In the subsequent phase, the researcher prepared electronic versions of the demographic data questionnaire, ethical decision-making questionnaire, and professional behavior questionnaire using the Porsline website. Porsline allows users to create various types of online questionnaires. After creating the online questionnaires, the corresponding links were shared with participants in both the experimental and control groups via WhatsApp. Privacy is a top priority in the Porsline system. Users create a username, email address, and password, ensuring that respondents' information remains protected and confidential. Only the user has access to this data. Subsequently, the pre-test was conducted with students using Porsline.

Three questionnaires were utilized to achieve the study objectives, as outlined below

The primary outcome of the implementation of the intervention was students' competency in ethical decision-making and the secondary outcome was the professional behavior of nursing students.

Demographic information questionnaire

demographic questionnaire including personal information: Age, gender, marital status, and source of information on these issues.

Nursing dilemma test (NDT)

The Nursing Dilemma Test (NDT) by Crisham, which is based on Kohlberg's Theory of Moral Development. This

tool was developed by Crisham in 1981 at the University of Minnesota after interviewing 130 graduate nurses. The questionnaire has six scenarios, each of which describes an ethical dilemma for the nurse. The topics include: Infants with severe congenital anomalies, compulsory administration of medicine to the patient, assisted euthanasia requested by the patient, introducing a new nurse to the ward, medication errors, and end-of-life care. Each scenario describes a hypothetical dilemma with three questions at the end; the questions of the second part determine the level of ethical decision-making skills. The respondents are asked to state the reason for their choices. In this section, six general statements expressing the reasons for the action taken are presented, and the participant is asked to select the options in their order of priority. The way each option is selected shows the type of moral reasoning by the respondent based on Kohlberg's theory. The respondent is scored according to the priorities they assign to each option. Six scenarios are presented in the nursing dilemma test. Three questions are asked at the end of each scenario. In this section, we only need to review the second question. Six statements are made in the second question asked at the end of each scenario, for which we should focus on a few points:

- a. Codification of the statements: This indicates thinking based on nursing principles and has been specified in the questionnaire and each statement has been assigned a code from 1 to 6.
- b. The statements are prioritized by the respondents.
- c. The score is calculated according to the prioritization. For instance, the first priority is given the highest score of 6.
- d. The total score given to statements with codes 5 and 6 in each scenario is then calculated, which indicates thinking based on nursing principles.

The respondents prioritize these statements from 1 to 6. If they prioritize the statements coded 5 and 6, it means that priorities 1 and 2 will obtain the highest scores. The first priority will score 6 points and the second priority will score 5 points. The total highest score is 11 in each scenario.

and 66 for all six scenarios. The lowest score belongs to the lowest priorities, which are 5 and 6.

in each statement. The scores obtained according to the priority of the statements are 2 and 1.

The total score is 3 points for each scenario and 18 points for all six scenarios. A higher score of principled thinking indicates a better ability for ethical decision-making [19]. The reliability of the NDT tool was calculated as 95% in a study by Zirak et al. (2011) at Tabriz University of Medical Sciences using Cronbach's alpha coefficient [20]. The validity of the tool using the content

validity index was confirmed by ten members of the academic staff at Tabriz Faculty of Nursing and Midwifery and medical ethics experts at Tabriz University of Medical Sciences.

Nursing students professional behavior scale (NSPBS)

The Nursing Students Professional Behavior Scale (NSPBS) was designed by Goz in 2010 with 27 items scored on a 5-point Likert scale. The five answer options are: Strongly Agree (5), Agree (4), Neither Agree nor Disagree (3), Sometimes Agree (2), and Strongly Disagree (1). Scores of 27–63 are classified as low, 64–100 as medium, and 101–135 as high in this tool. In the study by Goz et al. (2010), the reliability of the questionnaire was reported with Cronbach's alpha of 0.95 [21]. The validity of the tool using the content validity index was assessed and confirmed by ten members of the academic staff at Tabriz Faculty of Nursing and Midwifery and experts of medical ethics at Tabriz University of Medical Sciences.

Second phase: administering the intervention

The educational intervention was implemented in two stages.

Teaching the basics of ethical theory through an electronic learning package

As was customary of the university for e-learning, the class material about professional commitment and conduct was uploaded onto Navid e-learning system as voice-over slides for both the experimental and control groups and the class was instructed by an ethics instructor. The students joined the learning environment on their internet-connected computers with a username and password to receive the training course jointly with other students. The electronic content covered professional ethics and behavior topics for a duration of six hours. The system also recorded the students' learning activities, such as logging in and out, Q&A, participation in learning activities, and the quality of presenting and uploading their assignments.

Performing practical exercises for analyzing simulated scenarios

In the second stage of learning (in which the educational intervention was administered), four-hour practical training was given to both groups through two separate methods for deepening their knowledge of the principles of professionalism. For the control group, training on the principles of professionalism was given by the instructor as a one-day, in-person workshop that was held in compliance with all the COVID-19 health protocols. For the experimental group, a one-day online workshop was held using the developed educational multimedia. To prepare the content of the multimedia educational package, it

was necessary to determine the educational needs based on social accountability and justice-oriented. To achieve this, a supplementary study using a qualitative approach and contractual content analysis method was conducted. This study aimed to recognize and explain health workers' experiences related to ethical challenges in clinical environments within medical training centers. The results obtained from health workers, students, and scientific texts were compared with the educational curriculum's defined topics. After thorough analysis, codes, classes, and themes were extracted, and scenarios were crafted based on these findings. These scenarios adhered to professional principles and underwent review by ten medical ethics experts to ensure accurate content and necessary adjustments. The scenarios used in both workshops to initiate challenging debates were the same, but they were presented differently in the online and in-person workshops. In the in-person workshop, the scenarios were handed out to working groups in written format. After the students analyzed the scenarios and reported on their group work, the reports were summarized by the instructor and their key points were extracted and discussed. Finally, the students' activities in the working groups were evaluated. To observe the COVID-19 health protocols and due to the pandemic conditions, the in-person workshop for the control group was held in two identical sessions with 20 students. Each 20-member group was randomly divided into four working groups of five to carry out the group activities, discussions, and scenario analyses. The required explanations were given to the students on the method of running the training workshop and what was expected of them. The content of the ethical scenarios developed by the ethics instructor was presented to the participants as spoken or written text. Next, the working groups exchanged and discussed their views, reached a consensus, recorded their arguments in the report sheets, and presented it to the class. At the end, sufficient explanations were provided by the instructor to correct, complete, and summarize the results of the group discussions. During the group activities, the instructor acted as the facilitator of the groups and guided the participants. The students were also able to interact face-to-face with the instructor in their group for any questions and troubleshooting.

In the experimental group, the training workshop was run online by the instructor using multimedia educational content on the principles of professionalism. Adobe Connect software was used for remote training. The link and regulations of the workshop and the students' classification into the working groups were sent to them on WhatsApp a day before the workshop to familiarize them with the method of implementing the online workshop and what was expected of them during the program. To create a space for discussion and interaction as working

groups, the students were randomly divided into groups of five. A separate online meeting room was set up on WhatsApp for each group, and the instructor was added to all the groups as the facilitator to monitor the group activities. The students in the experimental group joined the program using the link and received training using the online multimedia content. Each educational content had four sections: (1) Playing a video on a challenging scenario regarding compliance with the principles of professionalism (each scenario taking 8–10 min); (2) Asking some challenging questions followed by group work among the students (15 min); (3) Theoretical discussions by instructors of medical ethics on the ethical dilemmas perceived in the scenarios and answering the challenging questions posed; and (4) Playing a video repeating that scenario, but this time with a proper interactive approach and in compliance with the principles of professionalism. For the online group work, after showing the first part of each scenario and asking some challenging questions, the students completed the stages of group discussion on the ethical dilemmas in the scenario in their WhatsApp working groups. These stages included: (1) Group members sharing voice or text messages to clarify the relevant concept; (2) Defining the problem; (3) Conducting group discussions and presenting ethical arguments and analyses based on theoretical principles; (4) Presenting their suggestions to solve the dilemma and to take preventive actions in future cases by brainstorming; (5) Setting goals; (6) Assessing the suggested solutions to solve the ethical dilemma; and (7) Selecting the best solution for the dilemma. If the students were faced with a particular issue or question, they were able to interact with the instructor in the online group and discuss the issue. At the end of the group work, the reports by the working groups were sent to the instructor in the respective meeting rooms and were then presented and discussed in Adobe Connect.

Third phase: measuring study outcomes

To measure the learning outcome, which included the competency of the learners to take ethical decisions and behave professionally following the training workshops, post-tests were administered online simultaneously to the students in both the experimental and control groups using the same tools as the pre-test two weeks after the learning program. An interval of two weeks between the educational intervention and the post-test was envisaged to access the recall memory (the mental process of retrieving information from one's memories of the past by encoding and storage) [22].

The data collected from the pre-test and post-test were analyzed in SPSS 26 and reported by descriptive and analytical statistics. To display the descriptive findings, absolute and percentage frequency distribution tables were

used along with central and dispersion indices, including mean and standard deviation. The ANCOVA was used to compare the learning outcomes between the two groups under study.

This study has been approved by the ethics committee of Tabriz University of Medical Sciences and registered under the ethics code IR.TBZMED.REC.1398.1261.

Results

The participants in the study included 80 s-semester nursing students studying at Tabriz University of Medical Sciences. Of these, 40 were placed in the experimental group and 40 in the control group. According to the demographic data, the mean age was 19.77 ± 2.03 years in the experimental group and 19.30 ± 3.11 years in the control group. The independent t-test did not show a statistically significant difference between the two groups based on age ($P=1$). There was an equal number of male and female students in both groups, with 22 females (55%) and 18 (45%) males per group. The results of the Chi-square test showed no significant difference in gender distribution between the two groups. All the students were single.

The secondary variables were measured by adjusting the effect of the primary variables and were analyzed using the ANCOVA. Table 1 presents the results of the ANCOVA to compare the ethical decision-making and professionalism of the groups under study in the pre-tests and post-tests.

The results shown in Table 1 suggest that the mean score for the two variables of professionalism and ethical decision-making increased after training in both the experimental and control groups. The increase in the mean score of professionalism and ethical decision-making at post-test was higher in the experimental group than in the control group. Considering the results of the ANCOVA, the difference between the two groups in the two variables of professionalism and ethical decision-making was statistically significant. In other words, e-learning was effective in nurses' learning about professionalism and ethical decision-making.

Discussion

During the COVID-19 pandemic, e-learning has enabled students to continue their education as a supplement to in-person learning. This study was conducted during the

COVID-19 pandemic to evaluate how e-learning on the subject of professional behavior and ethics affects nursing students' ethical decision-making and professionalism.

The study findings highlight the impact of e-learning on professional behavior and ethical decision-making among nursing students. Although pre-test scores were similar, significant differences emerged after e-learning in the experimental group. Therefore, e-learning had a greater impact on learning outcomes about professional behavior and ethical decision-making among the students. The ability to ethical decision-making and exhibit professional behavior is fundamental for enhancing the quality of nursing care. These skills are crucial in the field of nursing. The skill in ethical decision-making increases patients' trust in nurses, enhances interactions between them, and improves the quality of nursing care, fostering professional behavior [23]. Nurses' professional behavior toward patients also plays a significant role in improving and restoring patients' health [24]. After graduation, nursing students take on essential and vital responsibilities. Therefore, these skills should be emphasized right from the beginning. By searching various databases, the researchers did not find any studies with the same topic the effects of teaching the principles of professionalism by e-learning on ethical decision-making and professionalism in nursing students. Therefore, the studies that were somehow related to the main concepts of the current research were reviewed.

Many studies confirm the effect of education on learning the principles of nursing ethics and increasing cognitive skills. In the field of education, e-learning has been regarded as a context for creating change in teaching [25]. An e-learning space that is personal and flexible helps create an active learning environment [26]. Other studies have provided comparable results on this subject, suggesting that the use of e-learning to teach medicine increases knowledge acquisition, particularly on difficult and complex topics. Overall, the participants of the e-learning program performed better compared to those attending in-person courses. The researchers believed that e-learning provides a valuable opportunity for higher education institutes [27] and that e-learning positively affects academic progress [28, 29]. Baghbani et al. (2022) showed in their study that education based on two methods of electronic portfolio and online discussion forum increases and improves the level of ethical behavior in

Table 1 Comparison of mean and standard deviation of Professional Behavior and ethical decision-making score in intervention and control groups

Variable	Group	Pre-Test (Mean \pm Std)	Post-Test (Mean \pm Std)	Result of analysis of covariance
Professional Behavior	Intervention	117.42 \pm 5.21	125.70 \pm 6.20	P -Value = 0.005
	Control	117.12 \pm 10.60	120.95 \pm 9.28	$F=8.48$
Ethical decision making	Intervention	41.17 \pm 5.21	46.17 \pm 3.81	P -Value < 0.001
	Control	41.05 \pm 4.26	44.02 \pm 3.21	$F= 18.65$

students. Therefore, the implementation of such educational methods can be useful in improving, promoting and learning ethical behaviors in nursing students [30]. Chao et al. (2017) by investigating the effects of a web-based education model showed that after completing the course, the students of the experimental group showed a significant improvement in nursing ethical decision-making skills, including the skills of “asking questions”, “recognizing differences”, “comparing differences” and “recognizing the consequences of decisions made,” compared to their pre-class performance. Also, the students of the experimental group reported that this course led them to search and collect the information needed to solve the ethical dilemma [31]. Hudson et al. designed a study using an active teaching strategy—an online discussion board—to improve the interactive learning of beginning nursing students enrolled in their first face-to-face nursing course. The results of the pilot study showed the positive response of the students to the active teaching strategy and the improvement of overall success in the course, reflection, cooperation and increasing the knowledge of nursing students to enter the clinical environment [32]. The study by Kim et al. (2021) found that learners’ performance improved significantly after e-learning and distance education was therefore reported an appropriate tool for complementing traditional education [33]. On the contrary, some studies have shown that the traditional method of education is more effective than e-learning, including a study by Kazemnezhad et al. (2016) [34], which is inconsistent with the present study. This contradiction, however, may have been affected by the educational content itself and the method of its online presentation. Although various studies have reported that e-learning is a successful method, it must also be noted that this method is naturally more effective for independent learners, who are more inclined towards such learning strategies.

The research findings on the relationship between demographic variables and the study outcome show no relationship between demographic factors and ethical decision-making competency and professional behavior of nursing students. The study by Zirak et al. has not found a significant relationship between gender, age, marital status, and ethical decision-making scores of nurses [35]. Research by Khajavi et al. revealed no significant association between age and professional behavior, though gender showed a significant correlation [36]. The findings research of Safavi et al. showed that the demographic characteristics of nurses have a relative influence on their understanding of the ideal ethical decision-making and professional behavior [37].

During the study period, which coincided with the COVID-19 pandemic, educators encountered both challenges and opportunities. As in-person classes faced

difficulties, the focus shifted to alternative methods, particularly in cases where direct patient bedside experience was limited. These methods afforded students the chance to confront ethical challenges and make informed decisions in similar situations. Additionally, active student participation in virtual education enhanced their learning experience and improved their information technology skills. Alongside this, students engaged with learning content behaviorally, emotionally, and cognitively, resulting in increased satisfaction with their educational course.

In addition to the positive impacts that an educational package it had on ethical decision-making and professional behavior among students, the prepared educational package can also be used for continuous education based on the determined needs of nurses in hospitals, and the content of the educational package can be adjusted to suit the learners. This educational approach, considering its positive effects, can be utilized not only during the COVID-19 pandemic but also in normal conditions to facilitate learning opportunities. Furthermore, given that multimedia learning, due to engaging all senses, has a profound impact on long-term memory, participants can make quicker and more accurate decisions in similar clinical situations [38].

To encourage active student participation in online learning, educators can employ creative and engaging strategies. As global interest in e-learning continues to rise, researchers recommend exploring electronic teaching approaches across various subjects to enhance universal learning. Additionally, incorporating other innovative teaching methods into nursing ethics education is suggested. By using diverse instructional techniques, instructors can strengthen meaningful interactions and empower students in their online learning experience.

Strengths and limitations of the study

With the global outbreak of the COVID-19 pandemic and the change in educational programs from in-person to online, more effective online programs seem to be required, particularly for teaching practical nursing ethics. The present research was conducted for the first time in Iran by adopting this new nursing ethics and professionalism educational strategy. Multimedia, as an educational aid, has significantly impacted ethics education. During the COVID-19 pandemic, when group work faced challenges, using the WhatsApp social network, with the continuous guidance of the ethics instructor, group work related to how to deal with ethical challenges in the clinical environment according to the implemented scenarios. This aspect stands out as a strength of our study.

One of the limitations of this study was the use of self-reporting method to measure students’ professional

behavior. When responding to self-report questionnaires, participants often present their behavior more favorably. In such cases, social desirability bias may arise, leading participants to report what aligns with social norms rather than their actual behavior. This bias poses a potential threat to the validity of most studies that rely on the self-report method for completing questionnaires [39]. While experts in the field of professional ethics believe that to measure behavior, the methods of observing behavior in real conditions and in the context where things happen in the clinic are the best methods. Therefore, it is suggested that in future studies, measuring professional behavior with the method of observing real behavior in clinical situations should be taken into consideration. Also, difficult access to high-speed internet for some students was probably one of the factors affecting the quality of online classes. To resolve this problem, students were provided with university internet accounts, enhancing internet speed and ensuring uninterrupted access to online classes. This research was also limited to second-term students of the Nursing and Midwifery Faculty in Tabriz. In Iran, the nursing ethics course is taught in the second semester of the bachelor's program. Since these students lack clinical work experience and exposure to ethical challenges, the effectiveness of the intervention is assessed more accurately without confounding variables related to clinical experience and work history. Conversely, students in higher terms, who have clinical experience, face ethical dilemmas that require ethical decision-making and professional behavior. This difference in exposure contributes to changes in student assessment. As a result, researchers intend to include students from different academic semesters in various faculties in future studies by expanding the educational package.

Conclusions

Based on the findings of the present research, the learning method significantly impacts learning outcomes. Although both the experimental and control groups showed good academic progress, the results demonstrated that e-learning on professional behavior and commitment was more effective than traditional in-person instruction in enhancing the competence of learners for ethical decision-making and professional behavior. These research findings can draw the attention of educators and program planners toward the importance of utilizing innovative teaching methods.

The adoption of new teaching methods benefits both medical professionals and patients. By motivating and changing students' perspectives, it enhances their behavioral skills and awareness of professional responsibilities. Furthermore, it provides a new opportunity for improving ethical decision-making and professional behavior

among nurses. Therefore, recommending multimedia education to nursing instructors for educating nursing students is advisable. Given the effectiveness of this instructional approach, it is recommended to incorporate the prepared educational package in all medical universities and healthcare centers. Additionally, institutionalizing these trainings in continuous education programs for healthcare staff contributes to better patient rights protection, patient support, and the overall quality of patient care.

Abbreviations

NDT	Nursing Dilemma Test
NSPBS	Nursing Students Professional Behavior Scale

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Author contributions

The authors confirm contribution to the paper as follows: M.B and A.A did study conception and designed study. M.B did educational intervention. F.MT and P.R did data collection. S.Mi performed data analysis. M.B, F.MT and A.R did interpretation of results, draft manuscript preparation and final edit. All authors reviewed the results and approved the final version of the manuscript.

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Data availability

The datasets used and/or analysed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

This study has been approved by the ethics committee of Tabriz University of Medical Sciences with the code IR.TBZMED.REC.1398.1261 and Conscious consent was obtained virtually from all participants.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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