Learning Outcomes in Two Different Teaching Approach in Nursing Education in Iran: E-Learning versus Lecture

Neda Mehrdad[1], Mitra Zolfaghari[2], Naser Bahrani[3], and Sana Eybpoosh[4]

[1] *Nursing and Midwifery School , Tehran University of Medical Sciences, Tehran, Iran*

[2] *Nursing and Midwifery Care Research Center, Nursing and Midwifery School , Tehran University of Medical Sciences, Tehran, Iran*

[3] *Department of Statistic, Shahid Sattary University, Tehran, Iran*

[4] *Department of Epidemiology & Biostatistics, Kerman University of Medical Sciences, Kerman, Iran*

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Abstract- Traditional teaching methods used in medical education couldn't meet the need for keeping pace with up to date information. Present study has conducted in order to compare the effect of lecture and e–learning methods on nursing students' learning outcomes in the context of Iran. A cross-over design was applied. Study sample was consisted of 32 students which were in third semester of nursing bachelor program and were passing Maternal Child nursing course. The first part of the course was taught using lecture method during first four weeks; an e-learning method was the technique used to educate the remained part of the course during the second four weeks. Students' learning outcomes in each method, opinion toward and participation with both educational methods was assessed. No significant difference was found between students exam scores in both methods. Considering students' opinion toward educational methods, no significant difference was found between two methods in general but students reported better "capability" and "independency" in e–learning method while lecture was obtained higher scores in "effectiveness on learning" and "motivation" characteristics. E–learning can be used in teaching some nursing courses. It is recommended to use e–learning method with appropriate interactive strategies and attractive virtual environments to motivate students.

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Introduction

Technological advances have revolutionized teaching and learning processes (1). Fry (2001) notes that the emergence of new technologies, the rapid expiration of knowledge and training, the necessity of just-in-time information delivery, and the need for more cost-effective teaching methods have transformed the teaching-learning practices (2). Considering these constant and rapid changes, it is critical that learners in health care area being thought with latest knowledge and keep pace with up to date information (3). In response to these environmental and informational changes, there should be appropriate changes in information delivery strategies by health care education institutes.

The possibility of combining different information basis in learning process is not hampered by the limitations of traditional, face-to-face methods (4). Electronic learning (e-learning) can be defined as a teaching method which integrates the learning process and information technology (IT) by delivering educational material through the internet in order facilitate flexible and independent learning every where and every time (5-8). In addition, it promotes time management skills and contributes to lifelong learning (9-11).

The implementation of IT for health care education has been mostly adopted in developed countries (12-14). Recently, academic curriculum designers in Iran have paid attention to the application of IT in different aspects of education. For example, Tehran University of Medical Sciences (TUMS) launched an e-learning platform in the year 2002 to develop and appraise electronic courses and in order to foster its application

Corresponding Author: Mitra Zolfaghari
Nursing and Midwifery Care Research Center, Nursing and midwifery School , Tehran University of Medical Sciences, Tehran, Iran
Tel:+98 21 66927171, 912 2024265, Fax: +98 21 66933600, E-mail: Zolfaghm@sina.tums.ac.ir

(15); however the quality and effectiveness of these web-based educational programs have not been thoroughly and extensively evaluated (16). Moreover, to our knowledge, little is specifically known about the effect of e-learning courses on nursing education outcomes in Iran, and further investigations are clearly necessary in this area. The aim of this study was to compare the effectiveness of e-learning and face-to-face methods in nursing education in the "Maternal Child Nursing Care" course. Our findings can help researchers and curriculum planners to prepare and deliver future web-based or face-to-face courses more efficiently.

Patients and Methods

Study sample

32 nursing students who had eligibility criteria entered to the study. All participants were in 3rd semester of nursing bachelor program, passing the "Maternal Child Nursing Care" course at TUMS and participated voluntarily in the study.

Study design and procedure

A cross-over design was applied (17) in order to compare two different teaching methods on study sample. During the first four weeks, students received traditional education with 2-h lecture every week. In the second phase; students were given a password, the web address for the course (http://tums.ac.ir/education) and a short introduction on how to log-on the system and use the program. In this phase, they had to study the rest of the subject matter through an asynchronous on–line learning method. Although the students studied different course contents in each method, we assured the similarity of both contents based on their level of difficulty through gaining 10 educational experts opinion on prepared course. In traditional method, students participated orally in class discussion. In e-learning method they were engaged in electronic threaded discussions.

Students handed in their assignments in traditional class while in on–line method, class assignments were submitted as attachments to virtual spaces. An instructor was responsible for directing traditional class and used PowerPoint presentations and transparencies as instructional materials. In the second phase whole content was delivered through internet network and students could access to instructional audio–visual materials in course website. Course content was divided into 9 parts each lasted up to 30 minutes in order to meet the e–learning interface design and prevent students' boredom and distraction. Logging on the website was possible both at home and in a nearby community college computer lab. Students' learning outcomes and opinions toward both techniques were assessed at the end of the course. Both online and face to face classes were conducted by the researcher.

Measures

Students' individual characteristics: A 9 item questionnaire was developed in order to assess students' demographic characteristics (4 items) and computer and internet skills (5 items).

***Students' opinion toward educational methods*:** Participants' opinion was evaluated using a self–administered 35–item, likert scale questionnaire (19 items regarding e–learning and 16 items regarding traditional method). Students ranked these choices in an order of completely agree (score: 5) to completely disagree (score: 1) in a manner which best described their opinions. In addition the questionnaire had an open ended question inviting students to specify the educational method they most preferred. The questionnaire assessed students' opinion toward both methods in 4 main areas:

I) motivation: If the method attracts the learner to fallow the course eagerly (10 items: e. g. "Study in an e-learning system is enjoyable for me"; "Attending in class attracts me more")

II) Independency: How does the student feel independent in learning within the method (5 items: e. g. "I can follow my learning process whenever and wherever I want"; Face-to-face method makes me to participate in class for learning"),

III) Effectiveness: How does the student think about the effectiveness of the method on his/her learning outcome (12 items: e.g. I understand the course objectives and educational content deeply in e-learning"; "Since educational content is being delivered directly by the teacher in class, I learn better")

IV) Capability of using the method: How does the student feel about his/her ability to use electronic educational materials in the e-learning method or deal with traditional method requirements in face-to-face approach (8 items: e.g. "I can easily download and study educational material"; "I can't keep pace with educator's teaching speed in the class").

Students' learning outcomes: In order to evaluate students' learning outcomes a final test was administered based on educational content. Students' exam-based scores were considered as a criterion for evaluating outcomes of learning activities. The exam

was consisted of 15 multiple choice questions (46%), 4 true/false questions (13%) and 12 matching questions (38.6%). Each correct answer received one point, each wrong answer one negative point and zero points were given to questions which were not answered, total scores were ranged from zero to 20. The equal level of difficulty within both exams was confirmed. A board of 10 experts approved validity of the exam questions, the reliability for traditional exam was 0.73 and for e–learning method was 0.75.

***Students' participation*:** two different visual checklists were developed for each method. Students' times of involvement in the class and ask/answer questions was recorded in traditional method's checklist. Students' number and duration of referring and logging on the system, number of sending massages and numbers of using the chat room were considered as their participation in the e–learning method.

***Validity and reliability*:** in order to develop the initial format of the questionnaires, previous studies (18) and related literature was followed. Prepared instruments were evaluated for content and face validity by a panel of experts and their opinions was met. The reliability of the questionnaires was confirmed by Cronbach's alpha test (0.72 for opinion questionnaire of face-to-face method and 0.81 for the questionnaire of e-learning) and test-re-test procedure.

Ethical consideration

Study protocol was approved by research ethics committee of Tehran University of Medical Sciences. Recommendations of the Declarations of Helsinki and Tokyo were considered. Informed consent was obtained from all participants. The anonymity and confidentiality of participants' information was assured.

Statistical analysis

Data were obtained from all participants (n = 32) and entered to SPSS software (version 11.0). Descriptive statistics related to demographic characteristics were computed. Percentages were calculated for all nominal and ordinal variables; means and standard deviation were calculated for interval scale variables. Investigating the difference between both groups regarding students' educational outcomes and opinions toward both methods regarding four main characteristics, paired t-test was applied (analyses were considered statistically significant at 0.05 levels).

Answers to open–ended questions were analyzed using content analysis in order to categorize them into three themes: positive, negative and neutral comments. The steps in the analysis were: verbatim transcription, coding, categorizing, making an overview grid, comparing, condensing, and drawing out the main points (19).

Results

All Participants were unemployed females. Most of them were single (96.9%) and ranged in age between 18 to 29 years old (mean: 20.13, SD: 2.01). students' computer skills are summarized in table 1.

Based on students opinion about two methods, e-learning was perceived to be more effective on their "capability" ($P<0.005$) and "independency" to use the method ($P<0.005$), and lecture was reported to be better than e–learning in "effectiveness" ($P<0.005$) and "motivation" ($P<0.001$). Table 2 displays and compares students' opinion about two teaching methods.

Learning outcomes in both methods were similar and no significant difference was revealed between them (mean for the Traditional method 14.23 ± 3.36; for the e-learning method 14.35 ± 2.89; t-test $P<0.05$) (Table 3).

Table 1. Participants' level of familiarity with some computer skills

Skill	Very high	High	To some extents	little	Not at all*
Internet	1 (3.1)	4 (12.5)	14 (43.8)	8 (25)	5 (15.6)
Windows	2 (6.3)	3 (9.3)	16 (50)	5 (15.6)	6 (18.8)
Microsoft Word	1 (3.1)	4 (12.5)	10 (31.3)	5 (15.6)	12(37.5)
Microsoft power point	0 (0)	1(3.1)	2(6.3)	5 (15.6)	24 (75)

*values are in number (%)

Table 2. Comparison of both methods based on participants' opinion

Students opinion	Traditional	E–learning	t	*P*
Capability	10.19 ± 2.25	15.59 ± 3.90	5.66	<0.001
Independency	8.47 ± 2.09	12.47 ± 3.92	5.32	<0.001
Motivation	14.13 ± 4.61	12.34 ± 4.51	8.30	<0.001
Effectiveness	16.59 ± 2.70	13.28 ± 3.64	3.30	0.002
Total	14.84 ± 3.16	13.42 ± 3.75	1.55	N.S

Table 3. Comparing students' learning outcomes in two teaching methods

Exam scores	E–learning N (%)	Traditional N (%)
≤ 10	3 (9.4)	4 (15.6)
10 – 14	11 (34.4)	10 (31.3)
14 – 17	13 (40.6)	11 (34.4)
17 – 20	5 (15.6)	6 (18.8)
Mean (SD)	14.35 (2.89)	14.23 (3.36)

t–test, $P > 0.05$

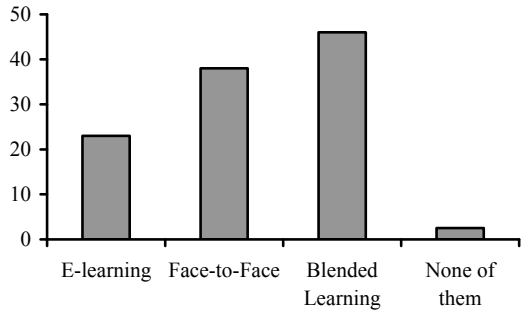

Figure 1. Students' preference of delivery system

In the e-learning method most participants logged on (n= 18, 66.66%) and referred to chat room more than 10 times (n=20, 62.3%), used online quizzes to test themselves 1–10 times (n=14, 44.9%) and asked questions in chat room (n=27, 84.4%). In traditional method most participants, involved in class more than 10 times (n=20, 62.3%) and asked and answered questions 1-5 times (n=21, 65.6%). Students' participation within the course was significantly higher in e-learning method rather than traditional approach (mean for e-learning method 11.13 ± 4.85, for the traditional method 4.44 ± 1.64; t-test, $P<0.05$). Students' preference about the method of education is shown in figure 1.

Discussion

Although type 1 medical universities in Iran have developed some aspects of e-learning including computer networks, multimedia, search engines, electronic libraries, distance learning or all of them (20), to our knowledge their effect on students' learning outcomes has rarely been assessed specially in educating Iranian nursing students. Our findings didn't reveal a significant difference in students learning outcomes between both methods. Although e-learning method wasn't more effective than traditional teaching, it is as effective as traditional framework. This adds to the growing knowledge about the equal efficacy of e-learning rather than traditional methods in nursing education (21).

We considered students' grade as the criteria for evaluating their achievement to learning outcomes which wasn't significantly different in both methods. However, students in e-learning method reported deeper understanding of the courses which seems to occur because of the independence nature of e-learning which mostly needs the exploration and construction of knowledge rather than gaining information in a one–way, up to down direction from teacher toward student in traditional in-class methods. Thiele assessed the learning process and outcomes of online students and noted that students' responsibility of their own learning and their access to educational content and even extra information regarding educational goals are some characteristics of e-learning method which rarely occur in traditional approach and results in achieving better outcomes in online education (22).

Although boredom is noted as a famous feature of in-class lectures (23) and may decrease the efficacy of this approach, in our study students reported traditional method as a more effective approach in teaching & learning activities. The soulless, artificial and emotionless nature of online education which lacks the direct communication of the teacher–learner has been criticized by some authors (24). Since our participants were in the third semester of nursing bachelor program, they may most used to in-class lectures which was similar to their previous study experiences and weren't too familiar with academic courses and new educational and information technologies; therefore they may had trouble learning this way comparing in–class lectures. Woo & Kimmick reported that nursing students were equally satisfied from e-learning method while study on students in upper grades which had better familiarity

with information technology and academic courses (24). Cook *et al*., noted that students who were older and employed were more satisfied from online learning rather than younger students (25).

On the other hand, students reported better capability of using and applying the e-learning method. It may be a by-product of considering some points in development of the e-learning website and courses including user friendliness, accessibility to computer, internet and e-contents and proper development and categorization of course content which let students with minimum IT knowledge and skills to apply the system easily. This finding is also in agreement with the findings of Buckley's opinion which believes that easy access to educational materials and convenience in learning in this method, promotes students' capability of learning in e-learning approach (23). In addition students reported that they had more independency in e- learning method. Self-governance has been noted as the core characteristic of e-learning method (26). The technological separation between teacher & learner relieves students from authentic class boundaries (21), thus students are decision makers about how, when and where start to learn in this way (25). Independency, itself helps to feel satisfied from learning process which is evident in the work of Billings *et al*. (2001); they reported that easy application of e-learning positively correlated with students' level of satisfaction (27).

Students were more motivated in the traditional method. It's believed that the learning in a real environment and receiving information from the teacher who tries to push students forward are elements which make students motivated in traditional method. This gives e-learning designers some clues in designing more interactive, attractive and accurately simulated online environment. On the other hand our participants were nursing students in third semester and were not very familiar with new educational methods. Shuster *et al*., concluded that older students found online education more effective, were better able to cope with the new method and had higher motivations comparing younger students (28). Students' involvement in learning activities was more in e-learning method. Frith and Kee concluded that nursing students had more connection with other students and instructors and reacted more positively toward interactions with other students and also with the learner – teacher in web – based teaching methods rather than in–class methods which resulted more participation rate (21).

This study has been conducted on nursing students in Iran as a developing country thus the results should be generalized to comparable situations. We couldn't use similar educational content because we aimed to compare these two methods on a single sample in order to lighten confounding effects of some factors thus we tried to homogenize both educational contents' level of difficulty. In conclusion, due to our findings, the influence of e-learning method on nursing students' outcomes was as same as traditional method therefore it could be considered as a complementary method beside traditional in–class approach and as an alternative strategy while holding class isn't possible.

Suggestions

Designing the effect of e-learning programs which better motivate learners on students' learning outcomes is suggested for future investigations. Moreover, assessing its effect on a larger sample size and tailoring with different learning preferences is recommended. In our study, e-learning led to same outcomes as those of traditional methods. Since each method has its own privileges and since most students in our study preferred a blended form of education, designing blended learning system and assessing its effect on learning outcomes is suggested.

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