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Original Article

Effect of the Flipped Classroom on the Patient Education Knowledge and Skill of Nursing Students: A Quasi-Experimental Study

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Abstract

Background: Strengthening patient education skills in students will improve the quality of future nursing care. With the advancement of technology, the tendency to use blended methods such as flipped classrooms has increased. This study was conducted to determine the effect of flipped classrooms on the patient education knowledge and skills of nursing students.

Objectives: This study aimed to investigate the effect of flipped classrooms on the patient education knowledge and skills of nursing students.

Methods: The present study employed a quasi-experimental design with a control group and a posttest-only format, conducted in 2024 at Birjand University of Medical Sciences. The study population consisted of 52 nursing students selected using a census method. The intervention group was trained using the flipped classroom method. While in the control group, the routine method was used. After the intervention, the patient education skills of both groups were assessed while interacting with a standard patient, utilizing an observation checklist. Data were analyzed in SPSS 16 software using Mann-Whitney, Chi-square, and two-way analysis of variance ($p < 0.05$).

Results: The mean score of student patient education skill (based on 20) was 15.1 ± 1.71 in the control group and 16.6 ± 1.97 in the intervention group. Results showed a statistically significant difference in the mean scores of patient education skill between the two groups ($p=0.009$).

Conclusion: It seems that the use of the flipped classroom approach can lead to the improvement of patient education skills of undergraduate nursing students. Therefore, it is recommended to prioritize the use of this approach in the practical unit of the training process for students.

Keywords: Active Learning; Patient Education; Nursing; Student

Background

Patient education is an important dimension of nursing care and a key role of nurses in providing healthcare services (1). Nurses spend a lot of time with patients and have a closer relationship with them. Therefore, most of the necessary training should be provided by nurses to patients (2). But many nurses do not have enough knowledge and skills about the methods and principles of patient education (3). Meanwhile, patient education is offered to nursing students and future nurses at the undergraduate level (4). Increasing knowledge and skill fills the gap between science and practice. Therefore, it is important to find suitable training methods for training future nurses. Traditional educational methods are mostly passive and teacher-oriented and do not lead to active learning.

On the other hand, modern teaching methods are active and improve students' learning (5). One of the best sources for new and active training is the use of blended teaching approaches that can improve the quality of clinical training (6). The "flipped classroom" approach is rapidly gaining popularity in health care

education disciplines to facilitate student participation in the learning process (7-9). Key elements of the flipped classroom include pre-class content, in-class activities, post-class evaluation, and student-generated questions (7, 10). To create a successful flipped classroom, students' intrinsic motivation is a key element in achieving desired learning outcomes. In the digital age, educators often combine computer technology with face-to-face classroom activities to increase student participation in pre-class learning tasks and post-class assignments (7, 8, 11). Another advantage of this teaching strategy is its proprietary nature, which allows each student to learn concepts at their own pace.

Students have the flexibility to play and pause lecture videos based on their preferences and can watch them multiple times if needed. In addition, this method allows students and nurses to learn the material at their desired time and place and turns it into a flexible educational strategy (12). Several studies have shown that students prefer the blended course structure and this type of learning can be effective in improving knowledge, decision-making skills, satisfying thinking abilities and reflections related to clinical practice (8, 13-17). However, in the study of Bingen et al., (2019) who studied the effect of the flipped class on the physiology course of nursing students, it was shown that many nursing students are dependent on physical and social interaction with the teacher, and it may be that they are not ready to accept the responsibility of studying outside the university. do not have More time should be allocated to allow students to adapt to new teaching (18). The flipped classroom is particularly well-suited for teaching practical skills like patient education because it separates knowledge acquisition from skill application. Students first learn theoretical content at their own pace before class, which frees up class time for active, hands-on practice, discussion, and problem-solving. This active engagement enhances skill development, critical thinking, and confidence, which are essential for practical tasks. In contrast, theoretical subjects like physiology primarily require knowledge retention and comprehension, which can be effectively addressed through traditional lecture methods.

In addition, the effects of the flipped classroom on students' skills are uncertain (19). Abeysekera and Dawson (2015) argue that this teaching arrangement has not been sufficiently studied and that there is a lack of empirical evidence for its effectiveness (20). Considering the importance of patient education in the provision of medical and health services and the limited research in new teaching methods in nursing, this study was conducted to determine the effect of the flipped classroom method on the patient education skills of nursing students.

Objectives

This study aimed to investigate the effect of flipped classrooms on the patient education knowledge and skills of nursing students.

Methods

Design and Setting: The present study was a quasi-experimental design with a control group and a posttest-only format, conducted at the Birjand University of Medical Sciences, Eastern Iran, in 2024. In this study, the participants were students who were enrolling in the *patient education* course for the first time, meaning they had no prior formal knowledge or training in this subject. Since the course was entirely new to them, their baseline knowledge and skills in patient education were assumed to be minimal or nonexistent before the intervention. Therefore, administering a pre-test would not have provided meaningful data, as all students started from a similar (near-zero) baseline. For this reason, we focused on assessing their knowledge and skills after the training (post-test) to evaluate the effectiveness of the educational intervention. This approach is consistent with studies involving novice learners in a completely new subject area.

Participants and Sampling: The study population was 52 second-semester nursing students, recruited through a census method, who took the patient education process unit. After obtaining permission from the ethics committee of Birjand University of Medical Sciences (ethics code 1402,495 IR. BUMS REC), and obtaining informed consent the researcher started the study. The inclusion criteria included willingness to participate in the study, absence of clinical work experience, and absence of participation in similar courses in the last few months. The exclusion criteria included unwillingness to continue participating in the research and absence of more than one educational session. The sample population was non-randomly divided into an intervention group (n=23) and a control group (n=29).

Intervention: Before the intervention, a briefing session was held to familiarize the students with the flipped classroom method. The steps of implementing the flipped classroom were as follows:

Before the class: one week before the start of the classes, materials and videos related to the principles of teaching patients with hypertension (including

nutrition and activities of patients with blood pressure) and diabetes (definition of the client, nutrition, and care activities from foot and insulin injection) were uploaded in LMS for students to study.

The educational videos were prepared by students from previous semesters under the supervision of the relevant professor. After receiving approval from the nursing professors of the faculty, they were given to the students of the intervention group. The duration of the videos was between 5-10 minutes.

In class: During the face-to-face sessions, which consisted of two two-hour sessions, the teacher discussed and resolved any issues and answered students' questions in the intervention group. Film criticism, role-playing, and small group work were also used.

In the control group, routine teaching, including lectures, was done.

After one month, a practical test was held, in which the scenario was provided to the students and their patient education skills were assessed in dealing with a standard patient (SP) and using an observation checklist. The evaluator was the teacher of patient education. The teacher who assessed the skills (who was also the instructor) was not blinded to the students' group assignment. It should be noted that before the intervention, the SP was trained on how to play his role. Two scenarios were designed, one for SP and the other for students, which were approved by the nursing faculty members. Also, students' knowledge was evaluated by multiple-choice questions (MCQs).

Tools

Data collection was done using the following tools:

A) Personal Information Questionnaire: This questionnaire included age, gender, place of residence, grade point average (GPA), and interest in nursing, which the students completed.

B) The written test included 20 Four-Option Multiple-Choice Questions. If the question is answered correctly, the score will be one; if the answer is wrong, the score will be zero. The total knowledge score of the studied subjects was obtained by summing the scores of the questions, with the score ranging from 0 to 20. The reliability of the written test was confirmed using test-retest in a pilot study (n=20). After two weeks, they were given a written test, and the Pearson correlation coefficient (r=0.85) was calculated.

C) The patient education checklist included 13 items about patient education skills. This tool was designed based on a literature review and completed by the observer. If the item is performed correctly, the score is one; if the item is performed incorrectly, the score is zero. Therefore, the obtained score was in the range of 0 to 13. For ease of expression, the score was calculated based on a scale of 20. The reliability of the observation checklist was confirmed by the observer agreement method, with two observers simultaneously scoring 10 student clients using the checklist for student skills. Then the kappa coefficient was 0.54. To enhance agreement, all assessors received standardized training sessions before data collection to ensure consistent application of the evaluation criteria. Despite these efforts, the moderate agreement observed is considered acceptable given the study context.

Data Analysis: In the present study, SPSS version 16 software was used for data analysis. To check the normality of the main research variables, Smirnov's Kolmogorov-Smirnov test was used. Chi-square test and Fisher's exact test were used to compare the frequency distribution of demographic variables, including gender, marital status, and residential status, between the two study groups. Also, to compare the mean variables of age and Grade Point Average (GPA) between two groups, the Mann-Whitney U test and the T-test were used. The Patient education skill score was assessed for normality using Smirnov's Kolmogorov-Smirnov test, which showed non-normal distribution ($p < 0.05$). Therefore, the Mann-Whitney U test was used. Since there was a significant difference in the frequency distribution of age in the control and intervention groups, two-way analysis of variance was also used. The analysis of the main research variables was done using an independent t-test and a Mann-Whitney U test at a significance level of $P<0.05$.

Results

The age range of students participating in the study was between 18 and 35 years. The mean age in the control group was 20.5±3.31, and in the intervention group, it was 20.1±1.57 years. The result of the Mann-Whitney statistical test showed that the two groups have a significant statistical difference in terms of mean age and are not homogeneous. The GPA in the control group is 16.3±1.09, and in the intervention group, it is 15.1±1.61. The results of the independent t-test showed that the two groups were homogeneous, as the difference in GPA was not statistically significant (p=0.193) (Table 1).

The majority of research units in both control (56.5%) and intervention (58.6%) groups were female. The results of the Chi-square test showed that there is no statistically significant relationship between the group and gender, and the two groups are homogeneous

in terms of this variable (p=0.879). The majority of the research units in both control (95.7%) and intervention (82.8%) groups were indigenous. The results of Fisher's exact test showed that there is no statistically significant relationship between the group and the place of residence, and the two groups are homogeneous in this respect (p=0.210). In the majority of research units in both the control (56.5%) and intervention (75.9%) groups, interest in nursing was high. The result of the Mann-Whitney statistical test showed that the two groups have no statistically significant difference in their interest in nursing and are homogeneous (p=0.125) (Table 1).

The mean score of student patient education skill (score out of 20) was 15.1±1.71 in the control group and 16.6±1.97 in the intervention group. The result of the Mann-Whitney test showed that there is a statistically significant difference between the two groups in terms of the mean score of patient education skill. The mean score of the students' patient education knowledge (score out of 20) was 10.6±2.61 in the control group and 13.0±3.05 in the intervention group. The result of the independent t-test showed that there is a statistically significant difference between the two groups regarding the mean knowledge of patient education. The effect size for knowledge and skill scores of the students under study, based on Cohen's d formula, is greater than 0.80 (Table 2).

Since there was a significant difference in the frequency distribution of age in the control and intervention groups, a two-way analysis of variance test was used, and the mean score of patient education skill after the intervention was compared according to group and age, and the results are presented Table 3.

As the results of the two-way analysis of variance in Table 3 show, the mean score of patient education skill after the intervention in the students of the two control and intervention groups was significantly different (p=0.026). However, no significant difference was observed in the mean score of patient education skill after the intervention based on age (p=0.056), and no interaction between group and age was found (p=0.917) (Table 3).

Discussion

The current study investigated the effect of the flipped classroom method on the patient education skills of nursing students. The research findings revealed that the intervention group achieved a significantly higher mean score in patient education skills compared to the control group. Although the results are promising, the non-randomized design means the observed differences, while statistically significant, cannot be definitively attributed to the intervention. Confounding factors may be involved. These results are consistent with various studies involving different statistical populations and educational content. The findings of the present study, with the studies of Kugler, et al. (2019) in the field of drug therapy (19), Kang, et al. (2021) in the field of general health care of nursing students (21), Park, et al. (2018) is consistent in the field of adult health nursing education (22). Fan et al. (2020) conducted a semi-experimental 18-week flipped classroom in an adult health nursing course on 485 nursing students. Their results have shown that the flipped classroom teaching approach positively affects students' clinical skills, communication, and responsibility, and helps them learn better in the adult nursing course. They also acknowledged that the flipped classroom with blended methods is a suitable and effective learning strategy for the nursing expert so that she can properly face nursing challenges (8)

The results of the Soltaninejad study (2024) showed that the mean score of physical examination skills was higher in the flipped classroom group than in the control group (23). In the study of Chikeme et al. (2024), self-directed learning readiness and learning achievements of the flipped classroom model approach were investigated in the research method class. Their results indicated a positive effect of the flipped classroom educational model on the preparation of nursing students for self-directed learning and learning outcomes in the research period (24). In addition, Dong et al. (2021) found that the flipped classroom is effective in improving students' academic performance and promoting the development of higher-level thinking abilities (25). The results of the above studies are consistent with the present study.

However, in another study, Bingen et al. studied the effect of the flipped classroom on the physiology course of nursing students. Their results showed that many nursing students are dependent on physical and social interaction with the teacher and may not be ready to accept new educational methods. Perhaps one reason for the lack of effect of the flipped classroom in this study is the nature of the physiology course (18). In the study by Cotta et al., students who preferred the traditional classroom reported that watching the video took more time, resulting in an intervention duration of more than one hour (26). But in the present study, the duration of the films was less than 10 minutes. In the present study,

a blended teaching method was used. Before starting the class, the students watched educational videos related to teaching the patient and then critiqued them in class. The use of educational videos is a relatively new method, which is claimed to improve education from low levels of knowledge learning to higher levels of deep learning (27). In this regard, Rourke et al. conducted research comparing the effectiveness of educational programs using educational videos versus traditional methods on learning midwifery examination skills in nursing students. Their results have shown that students who were exposed to the video-assisted educational program had more skills (28). However, in the study by Roman Sanchez et al., male students were not as motivated to watch the movie as female students. This is because female students are more likely to seek supplementary resources as teaching aids, such as video-based learning, than male students (29).

It is important to choose a suitable teaching method to improve learners' learning and performance. In nursing education, having theoretical knowledge alone is not enough. Experts have suggested training in environments closer to reality to acquire and improve skills. The lecture method is suitable for learning at the cognitive level and for learning at higher levels than the cognitive field. Additionally, new educational methods, such as role-playing, should be used to enhance attitude and performance (30, 31). Considering that role playing creates a safe and stress-free environment for gaining experience in a clinical environment, this is a suitable method for improving performance (32). In the present study, after reviewing the films, the students engaged in classroom activities related to the selected topic. Delnawaz et al. (2018) acknowledged that the role-playing method was effective on students' knowledge and performance in triage education (33). The results of this study are also in line with the present study. In Sheng-Miauh Huang's study (2023), it was shown that role playing improves nursing students' caring behavior (34). In the study by Jasmi et al. (2021), the effectiveness of the role-playing method on speech in moral performance is also mentioned (35). This study has limitations that make it difficult to generalize the results.

This study has some limitations that affect the generalizability of the results, notably that it was conducted solely on nursing students. Given the limited research in this area, we recommend conducting similar studies in other disciplines and curricula using larger and more diverse samples to enhance the applicability of the findings to a wider population. In addition to the influencing factors in the present study, other factors affecting students' education should also be considered. The use of a census sampling method combined with non-random allocation into groups represents a significant limitation, as it introduces a high risk of selection bias. To mitigate this issue in future research, probabilistic sampling and random assignment methods are recommended to enhance representativeness and reduce bias. The teacher who assessed the skills was also the instructor and was not blinded to the students' group assignments. This lack of blinding poses a potential risk of performance and detection bias. To minimize this limitation in future studies, it is recommended to use blinded assessors who are independent of the intervention delivery to ensure objective evaluation and reduce bias. A Kappa value of 0.54 indicates moderate interrater agreement, which is concerning as it suggests only a fair level of consistency between observers. Despite standardized training efforts, this moderate reliability limits confidence in the accuracy of skill measurements. This is raised as a limitation of the study, and it is acknowledged that values below 0.60 may weaken the robustness of the observation checklist results and indicate cautious interpretation.

Conclusion

Despite limitations such as non-random allocation and the lack of blinded assessment, our findings suggest that the flipped classroom approach may improve patient education skills of undergraduate nursing students. Therefore, further research with more robust designs (randomized controlled design and blinded outcome assessments) is recommended, but this approach shows promise for integration into practical nursing education.

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Conflict of interests: There is no conflict of interest.

Ethical approval: Following the principles of research ethics, this study has been approved by the ethics committee (code: IR.BUMS.REC.1402.495). The ethical principles have been fully observed in this study. Participants were allowed to withdraw from the study at any time. Also, all participants were aware of the research process. Their information was kept confidential.

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Table 1. Comparison of demographic characteristics in intervention and control groups

Variable	Group		P-value
	Control	Intervention	
Age, Mean (SD)	20.5(3.31)	20.1(1.57)	0.046*
GPA, Mean (SD)	16.3(1.09)	15.1(1.61)	0.193**
Gender, N(%)			0.879***
Male	10 (43.5)	12 (41.4)	
Female	13 (56.5)	17 (58.6)	
Residence, N(%)			0.210****
Native	1(4.3)	5(17.2)	
Non-native	22(95.7)	24(82.8)	
Interest in nursing, N(%)			0.125*
High	13(56.5)	22(75.9)	
Medium	9(39.1)	7(24.1)	
Low	1(4.3)	0(0.0)	

*Mann-Whitney, **T-test, *** chi-square, **** Fisher's Exact

Table 2. Comparison of the mean knowledge and skill scores of the students under study in the two control and intervention groups

Variable	Group		P-value	Effect size
	Control (mean (SD))	Intervention (mean (SD))		
Knowledge of patient education (score out of 20)	10.6(2.61)	13.0(3.05)	0.004**	0.85
Patient education skill (score out of 20)	15.1(1.71)	16.6(1.97)	0.009*	0.82

*Mann-Whitney, **T-test

Table 3. The comparison of the mean score of patient education skill after the intervention in the students of the two control and intervention groups according to age

Source of changes	Sum of squares	df	Mean square	F	p
Group	23.82	1	23.82	612.0	0.026
Age	5.09	1	5.09	130.7	0.056
Group and Age	0.039	1	0.039	0.01	0.917