Comparison of the Flipped Classroom Versus Demonstration Education Method on Nasogastric Tube Insertion Practical Skill of Nursing Students

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Abstract

Background: The education of medical sciences requires a fundamental change to improve clinical decision-making capacities by using new teaching methods.

Objectives: The present study aimed to compare the effect of the Flipped classroom (FC) with demonstration education (DE) in the practical skill of nasogastric tube (NGT) insertion.

Methods: The present interventional study was conducted in a faculty of nursing for two sequence semesters. Nursing students were selected by census sampling method and then randomly allocated to two groups, FC (19 and 17 participants) and DE (18 and 19 participants). In the DE method group, the NGT insertion was explained to the nursing students in the skill laboratory. Then, in the FC group method, a week ago, the video and the written educational content related to the NGT insertion procedure were provided to the nursing students. In both groups, two sessions were provided for the nursing students to practice the NGT insertion procedure independently on the Moulage. A comparison of the practical skill and satisfaction scores was done one week after intervention in both groups. The descriptive statistics, chi-square, Fisher exact test, and Mann Whitney u test were applied using the SPSS software, version 24. A P-value less than 0.05 was considered statistically significant.

Results: The results of the statistical tests showed a non-significant difference between the two groups in terms of age, mean diploma score, gender, marital status, native status, and living in a dormitory. In the first semester, the practical skill score was non-significantly higher in the FC group [FC: 70.00 ± 2.16 vs. DE: 68.94 ± 1.62 , p=0.105], but in the second semester, it was significant in the FC group [FC: 67.70 ± 5.65) vs. DE: 61.00 ± 7.64 , p=0.005]. The nursing students in the FC group had significantly higher satisfaction compared to the DE group in both semesters [FC: 99.44 ± 1.61 vs. DE: 93.10 ± 4.70 , p<0.001 and FC: 94.11 ± 6.18 vs. DE: 86.15 ± 6.31 , p=0.001, respectively).

Conclusion: This study showed FC method can be used as a satisfactory and effective teaching approach in NGT insertion. So, it is recommended that educational managers consider it because of the high satisfaction of nursing students in clinical teaching.

Keywords: Nursing; Professional Practice; Teaching; Clinical Competence; Students; Education; Enteral Nutrition

Background

Most nursing students' learning process occurs in a clinical setting. So, clinical education is considered the main basis of nursing education (1). The study's finding on Iranian nursing students showed a very poor self-

evaluation of pharmaceutical care skills. So, more than 65% of students reported insufficient skills (2). Most nursing education programs use the demonstration education (DE) method in which the teacher transfers knowledge to the students. Passive involvement in

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information processing and lack of development of the necessary insight into the transient process and knowledge of clinical setting are the main limitations of the DE method (3). The education of medical sciences, including nursing, requires a principal change to improve clinical decision-making capacities by using new teaching methods and strengthening studentcentered learning (4). One of the growing and technology-based educational methods is the flipped classroom (FC) approach (5). Despite the DE method, in the FC approach, the learners watch videos of recorded lectures before class, do their studies and assignments before class, present in the classroom readily, and participate cooperatively including group discussions and case studies (6). The results of a study in South Korea showed the FC method was a useful approach to self-directed learning ability and willingness to critical thinking of nursing students during fundamental nursing courses (7). Also, an Iranian study revealed the positive effects of FC compared to the DE method on the knowledge of using medical equipment (infusion pump, monitoring, and electroshock) in senior nursing students (8).

Another study in South Korea, which was conducted on second-year undergraduate nursing students, showed that the FC method can be used as an effective educational program to improve students' self-efficacy, critical thinking, and communication competence (9). Also, an Iranian study on dental students revealed the FC method could improve and satisfy dental students in the periodontal and pediatric per clinical courses (10). Another Iranian study on medical students in the course of physiopathology showed the FC method can be useful (11). A Chinese study showed that the FC teaching method is an effective approach for ophthalmology students without clinical experience (12). Another Chinese study reported that the FC was an effective method in teaching bag-mask ventilation and intravenous cannulation as a clinical skill teaching approach among medical students (13).

Objectives

According to the literature review and considering the lack of comparison study between the FC and DE in the nursing fundamental course in Iran, the present study aimed to compare the effect of the FC with DE in the practical skill of nasogastric tube (NGT) insertion.

Methods

Study Design and Sampling: The present posttest interventional study was conducted in a faculty of nursing affiliated with Mazandaran University of Medical Sciences, Sari, Iran, for two sequence semesters on nursing students who were accepted in the same university entrance exam in 2022, including the 2nd 2021-2022 semester and the 1st 2022-2023 semester. The nursing students were selected by census sampling method. So that a list of students (in coded form) was prepared from the nursing faculty education unit, and then they were randomly assigned to two groups, FC (19 and 17 participants) and DE (18 and 19 participants) method, according to the random numbers table. To ensure the adequacy of the sample size, after conducting the study and calculating the effect size based on G power software with a sample size of 34 participants and α =0.05, the power of the study was calculated to be 0.90, which is acceptable. The inclusion criteria consisted of 1st-semester nursing students who were eligible for the nursing fundamental course and willing to participate. Unlicensed assistive personnel and nursing students who participated in the course again were excluded.

Data Collection Tools: The data collection tools were demographic, practical skill, and satisfaction questionnaire. The demographic questionnaire consisted of age, mean diploma score, gender, marital status, native status, and living in a dormitory. In the present study, native status was defined as being born in Mazandaran province. The sociodemographic questionnaire had been completed before the intervention.

The 36-item practical skill checklist was developed by researchers based on the two valid nursing fundamental textbooks (14, 15) and scored on a 3-point Likert scale (0=Failure to perform the procedure correctly, 1= incompletely performing the procedure and 2= Perform the procedure correctly, and completely). The qualitative content validity of educational content and also practical skill checklist were assessed by five nursing faculty members. The reliability of the practical skill checklist was calculated at 0.82 using Intra Class Correlation (ICC) by 2 independent evaluators. Also, the practical skill checklist had validity (14, 15).

Nursing students were asked to rate their satisfaction with the educational method from 0 (very dissatisfied) to 100 (very satisfied) using the Visual Analogue Scale (VAS). This scale is used to assess satisfaction (16). VAS was used in other studies to assess the level of student satisfaction (17). The validity of VAS was assessed in Adib Haj Bagheri 's study on nursing students (18).

The practical skill checklist and VAS had been completed by an evaluator who had not been a teacher of nursing students in the skill laboratory one week after intervention in both groups. So that the evaluator gives a grade to the student according to the checklist after asking the questions based on the different steps of the procedure.

Educational Method: In the DE method group, the NGT insertion was explained to the skill laboratory nursing students, and the teacher answered their questions. In two sessions during the next week (from 8:00 am to 2:00 pm), the nursing students independently practiced the NGT insertion procedure in the skill laboratory on the Moulage of NGT.

Then, in the FC method, learning objectives were identified a week ago, and pre-class material, including the video and the written educational content related to the NGT insertion procedure, were provided to the nursing students by the same teacher as the DE method group. Also, the teacher organized pre-class activities. One week later, a teacher planned the in-class activity and the NGT insertion procedure, which was explained by a teacher with the collaboration of the students in the skill laboratory. To assess the learning, the teacher involved the students. They asked questions, answered, and discussed the procedure.

On the other hand, the procedure was taught using the cooperative teaching method. The step was educational support. Similar to the DE group, in two sessions during the next week (from 8:00 am to 2:00 pm), the nursing students independently practiced the NGT insertion procedure in the skill laboratory on the Moulage of NGT (19). *Data analysis:* Statistical analyses were performed using the SPSS software, version 24. Also, descriptive statistics were used to describe the data, including frequency, percentage, mean and standard deviation. The result of the Kolmogorov Smirnov test showed data were abnormal so the non-parametric tests were used. The chi-square and Fisher exact test were used to compare the two groups regarding gender, marital status, native status, and living in the dormitory. Mann-Whitney u test was used to compare the two groups in terms of age, diploma score, practical skill score, and satisfaction. A P-value less than 0.05 was considered statistically significant.

Results

The result of the Kolmogorov Smirnov test is presented as follows: The 2nd 2021-2022 semester: *p*-value: 0.049 for satisfaction and *p*-value<0.001 for the rest of variables & the 1st 2022-2023 semester: *p*-value=0.036 for practical skill, *p*-value=0.003 for diploma score and *p*-value<0.001 for the rest of variables. **Results of the 2nd 2021-2022 Semester**

Table 1 shows a comparison of the sociodemographic characteristics of nursing students in the FC vs. DE method groups. The results of the Mann Whitney u test showed there was a non-significant difference between the two groups in terms of age [FC: 19.78 ± 0.71 vs. TE: 19.94 ± 1.05 , P=0.580] and mean of diploma score (FC: 18.85 ± 0.66 vs. TE: 18.73 ± 0.99 , P=0.831].

| | 2 nd 202 | 1-2022 semest | er | 1 st 2022-2023 semester | | | |
|----------------------------|---------------------|---------------|--------------|------------------------------------|--------------|---------------|--|
| Variable | Group | | P-value | Group | | P-value | |
| | FC (N=19) | DE (N=18) | | FC(N=17) | DE (N=19) | | |
| Gender, n (%) | | | 0.515^{*} | | | 0.736* | |
| Female | 10 (52.6) | 7 (38.9) | | 8 (47.1) | 7(36.8) | | |
| Male | 9 (47.4) | 11 (61.1) | | 9 (52.9) | 12 (63.2) | | |
| Marital status, n (%) | | | 1.000^{**} | | | 1.000^{**} | |
| Single | 19 (100) | 18 (100) | | 17(100) | 18(94.7) | | |
| Married | 0 (0.0) | 0 (0.0) | | 0 (0.0) | 1(5.3) | | |
| Native status, n (%) | | | 0.230** | | | 0.721^{*} | |
| Yes | 16 (84.2) | 18 (100) | | 6(35.3) | 5(26.3) | | |
| No | 3 (15.8) | 0 (0.0) | | 11(64.7) | 14(73.7) | | |
| Living in dormitory, n (%) | | | 1.000^{**} | | | 0.316^{*} | |
| Yes | 1 (5.3) | 0 (0.0) | | 10(58.8) | 12(63.2) | | |
| No | 18 (94.7) | 18 (100) | | 7(41.2) | 7(36.8) | | |
| Age (Year), Mean (SD) | 19.78 (0.71) | 19.94(1.05) | 0.580*** | 19.35 (1.05) | 19.42 (1.01) | 1.000^{***} | |
| Diploma score, Mean (SD) | 18.85(0.66) | 18.73(0.99) | 0.831*** | 19.17 (0.41) | 19.21 (0.22) | 0.802*** | |

Table 1. Comparison of the socio-demographic characteristics of nursing students in the FC vs. DE method groups

*Chi-square, **Fisher exact test, ***Mann Whitney u test

| Variable Sc | | 2 nd 202 | 21-2022 semest | ter | 1 st 2022-2023 semester | | |
|-----------------|----------------------|---------------------|----------------|---------|------------------------------------|--------------|---------|
| | Score range of scale | Group | | P-value | Gro | oup | |
| | Score range of scare | FC | DE | | FC | DE | P-value |
| | | Mean (SD) | Mean (SD) | | Mean (SD) | Mean (SD) | |
| | | | | | | | |
| Practical skill | 0-72 | 70.00 (2.16) | 68.94 (1.62) | 0.105* | 67.70 (5.65) | 61.00 (7.64) | 0.005* |

Table 2. Comparison of the practical skill and satisfaction in the FC vs. TE method

*Mann Whitney u test

Most nursing students were females in the FC group (52.6%) and males in the DE group (61.1%). However, the statistical test showed this difference was not significant between the two groups (P=0.515). All of the nursing students were single in two groups.

Although the mean \pm SD of the practical skill score was higher in the FC group, the statistical test showed this difference was non-significant [FC: 70.00 \pm 2.16 vs. DE: 68.94 \pm 1.62, P=0.105]. However, the nursing students in the FC group had significantly higher satisfaction compared to the DE group [FC: 99.44 \pm 1.61 vs. DE: 93.10 \pm 4.70, P<0.001] (Table 2).

Also, the results indicated that the FC method had a medium effect size compared to the DE method regarding practical skill score (d=0.553).

Results of the 1st 2022-2023 Semester

The results of the Mann Whitney u test showed there was a non-significant difference between the two groups in terms of age [FC: 19.35 ± 1.05 vs. TE: 19.42 ± 1.01 , P=1.000] and mean of diploma score (FC: 19.17 ± 0.41 vs. TE: 19.21 ± 0.22 , P=0.802]. Most nursing students were males [FC: 52.9% vs. TE: 63.2%, P=0.736] and single in both groups (FC: 100% vs. DE: 94.7%, P=1.000). The statistical test revealed a non-significant difference between the two groups (Table 1).

Despite the previous semester, the mean \pm SD of the practical skill score was significantly higher in the FC group [FC: 67.70 \pm 5.65 vs. TE: 61.00 \pm 7.64, P=0.005]. Also, the nursing students in the FC group had significantly higher satisfaction than the TE group [FC: 94.11 \pm 6.18 vs. DE: 86.15 \pm 6.31, P=0.001] (Table 2).

Also, the results indicated that the FC method had a larger effect size than the DE method in terms of practical skill score (d=0.989).

Discussion

The main purpose of the present study was to compare the effects of two educational methods, FE and DE methods, on the practical skill and satisfaction of nursing students. The results of the present study showed the nursing students in the FC group had higher practical skills and satisfaction than the DE group. A quasi-experimental study was conducted on Omani nursing students to assess the effect of FC on performance and satisfaction in respiratory system items in anatomy and physiology courses. The results showed the mean score of students who underwent FC educational method had a higher final examination score than the traditional lecture group (20). Also, the study's finding in Cyprus showed FC method had effects significant positive on venous thromboembolism course learning among nursing students (21). The finding of a Spanish study showed FC method vs. face-to-face learning method positively affected attitude, skills, and global competence using evidence-based practice in undergraduate nursing students (22). In the FC method, the students are motivated due to the students-centered learning environment and self-control to develop the learning skills (23).

The results of a quasi-experimental study on Iranian postgraduate students in the Faculty of Medicine showed that the psychological empowerment scores increased after intervention for the two groups. However, the mean post-test score was higher in team-based learning than in the FC group (24). However, the results of a Chinese quasi-experimental study on nursing students revealed that the FC method developed critical thinking, self-cognition, and evaluation abilities of nursing students in the community nursing course. But, the satisfaction score was not statistically different (25).

The difference may be due to the dependent variable of the Chinese and our study. In the current study, the dependent variable had a practical nature. Also this satisfaction could be due to the novelty of the teaching method that participants did not experience so far. Also, humans tend to actively engage in exposure to a novel technology (26). A Chinese explanatory mixed-methods study was performed on nursing students' psychomotor skill instruction showed the FC method was more suitable for active students. Also, the passive students had significantly higher stress perception and lower satisfaction than the active nursing students (27). But in the present study, the mean score of satisfaction and practical skill was higher in the FC group. The results of a study on Chinese nursing students revealed the combination of FC and workshop is effective in developing nurse's active learning abilities and clinical thinking (28). The primary factors contributing to high satisfaction in the FC method may include the model's provision of active learning opportunities, efficient utilization of classroom time, the facilitation of selfpaced learning, and the ability for students to access videos at their convenience, regardless of location (29).

The finding of a mixed-method study on third-year nursing students showed improving independent learning, enhancing peer learning, and increasing teacher-student interaction were the main outcomes of the Audio-Visual FC in maternal nursing laboratory course (30). The results of an Iranian study revealed that the online FC method had a significant effect on metacognitive awareness and self-directed readiness improvement (31). It seems that self-directed readiness is the prerequisite of the FC method and faculty teachers should consider this concept to achieve the optimal learning outcome. On the other hand, active responsibility in the learning process is the FC approach's main characteristics (32). The outcomes of an exploratory qualitative research on Sri Lankan nursing teachers showed their perception of FC readiness. The teachers believed educational technology, acceptability of the FC pedagogy, and the educational environment are the main prerequisites of readiness (33). So, the teachers should consider it in designing FC approaches.

The limitation of the present study was allocating the nursing students of one class to two groups, and the small sample size might obscure the real effect of the FC method compared to the DE method. So, we conducted the study for two sequence semesters. In addition, we use the FC method for only one type of practical skill for nursing students. Also, the evaluation had been done for a short period and is suggested to evaluate the long-term outcomes of the FC method in clinical teaching.

Conclusion

This study showed FC method can be used as a satisfactory and effective teaching approach in NGT insertion. So, it is recommended that educational managers consider it because of the high satisfaction of nursing students in clinical teaching.

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