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Original Research

Finding the Most Effective Method in Anatomy Lesson in Nursing Education: A Comparison of Classical Lecture and Flipped Classroom

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ABSTRACT

Objective: The objective of this research is to determine the comparative superiority between classical face-to-face education and flipped classroom models from the students' perspective.

Methods: This educational intervention study involved 109 first-term students from Akdeniz University Faculty of Nursing who participated in all the discussed flipped training and classical lecture courses. The study included the administration of feedback forms and an exam.

Results: The averages of the total student feedback scores for the classical lecture and flipped classroom were 45.9± 11.7 and 46.0± 8.5, respectively, and the difference between them was not statistically significant (student t-test, p=0.986). The mean of the knowledge acquisition test total scores were found to be 4.79 ± 1.62 and 4.82 ± 1.65, respectively, and the difference between them was not statistically significant (student t-test, p=0.872)

Conclusion: In conclusion, the results suggest that while the flipped classroom approach does not negatively impact knowledge acquisition or student satisfaction compared to traditional lectures, it does not offer a significant overall advantage. Further research and exploration may be needed to fully understand the potential benefits and limitations of the flipped classroom model in enhancing critical thinking skills and knowledge absorption.

Keywords: Flipped Classroom, Face-to-face Education, Nursing Education, Anatomy

INTRODUCTION

Anatomy courses hold indisputable importance in nursing education, both during faculty education and in professional practice. They are typically included as one of the foundational courses in nursing education, particularly in the first semester, providing a fundamental understanding of nursing core education [1]. While traditional face-to-face lectures have been the long-standing approach for anatomy education in nursing faculties worldwide, there is a growing interest in exploring more effective and innovative educational models [2]. Online education, in particular, has gained widespread use globally [3]. The influence of technology on medical and educational sciences has brought forth a multifaceted impact, encompassing both positive enhancements and potential drawbacks. Counterfeit and replicated journals may lead researchers astray; in order to safeguard valuable discoveries, scientists need to remain watchful, meticulously assess publications, and opt for esteemed journals known for their meticulous peer-review procedures and significant influence ratings [4]. Despite this potential drawback, technology has made significant contributions to the

field of anatomy education, introducing methods such as three-dimensional (3D) anatomy atlases, virtual anatomical images, and digital reminder cards [5]. In parallel, the flipped classroom model has been increasingly adopted in our country and globally, benefiting from technological advancements [6]. Additionally, it has been discovered that delivering lectures in the form of video recordings in higher education is advantageous for students, as they can set their own study pace, engage in question-answering, and interact more with the content [7].

In our study, we hypothesize that the flipped classroom method does not compromise the level of student satisfaction and knowledge acquisition achieved through traditional face-to-face education, and may even yield better results. Accordingly, the aim of this study is to compare the flipped classroom method with the classical education method in terms of student satisfaction and knowledge acquisition levels.

MATERIALS AND METHODS

Study Setting

The undergraduate education program at Akdeniz University Faculty of Nursing is four years, and theoretical and applied Anatomy courses are offered in the education program during the first semester of the first year. Theoretical courses are mainly taught in the form of classical lecture courses, and as of the 2022-23 academic year, some theoretical courses have started to be delivered using the flipped classroom model.

Study Group

The study group consists of 109 students who are first-term students at Akdeniz University Faculty of Nursing and have attended all of the flipped classroom and classical lectures discussed in the study. Students who did not attend any of the flipped classroom and classical lecture courses were excluded from the study.

Main Points;

- The study aimed to compare traditional in-person classes with the flipped classroom model in human anatomy education, focusing on their impact on critical thinking skills and learning.
- Results showed that the flipped classroom didn't hinder learning or satisfaction but didn't significantly outperform traditional lectures in terms of learning outcomes.
- The study didn't establish a clear advantage or disadvantage of the flipped classroom over traditional lectures.

Study Design and Flow

In the study, which was organized as an educational intervention study, flipped classroom activities constitute the educational intervention. Comparisons were made with classical lecture in terms of these two parameters to investigate whether this intervention compromise students' satisfaction and knowledge acquisition. In Akdeniz University Faculty of Nursing, 1A and 1B classes of the first term, randomly divided into two groups, the subject titled 'Anatomy of Peripheral Arteries' was taught using two different methods. One group received instruction through the flipped classroom, while the other group received traditional face-to-face lectures. For the flipped classroom group, two video recordings were prepared: 'Anatomy of Upper Extremity Arteries,' lasting 39 minutes, and 'Arteries of Lower Extremities,' lasting 26 minutes. These videos were uploaded into the section reserved for the lesson in Microsoft Teams (Microsoft Corp, Redmond, WA). Following this, a 50-minute discussion lesson was held with the students who came to the class after watching the video recordings, using interactive methods in the lecture hall.

The group that received traditional face-to-face training attended a 50-minute lecture on 'Peripheral Artery Anatomy,' presented by the trainer using slides. During this session, students were allowed to ask questions or express their opinions.

The same trainer conducted the presentations in the video recordings prepared for the flipped classroom group, managed the discussion session in the flipped classroom group, and delivered the classic face-to-face lecture. The trainer is a faculty member with high skills and experience in education. A questionnaire including a feedback form was administered to all students at the end of the discussion session of the flipped classroom and classical lecture course through Google Forms (Google LLC, Mountain View, CA). In addition, a knowledge acquisition exam consisting of multiple-choice questions was applied to both groups at the end of the classses via Google Forms.

Data Collection Tools Used in the Study

Student feedback form: A 12-item form, prepared by experts in the field of medical education, was used to determine the satisfaction levels of students with both the classical lecture and the lesson taught with the flipped classroom model. The feedback form is presented in Table 1. Students were asked to read each item and evaluate the extent to which they agree with the statement by giving a score between 1 and 5 (1: Strongly

disagree, 2: Disagree, 3: Undecided, 4: Agree, 5: Strongly agree). The total score for each form could range from the lowest 12 to the highest 60 points.

Knowledge acquisition exam: To measure the knowledge acquisition levels of students at the end of the lecture and flipped classroom, a test containing ten multiple-choice questions with five options and a single correct answer was administered. The questions used in the exam are presented in Table 2.

Analysis of the Data

All statistical analyzes were performed using IBM SPSS version 23. The averages and standard deviations of the total scores obtained from the feedback form and the post-lesson knowledge acquisition exam were calculated using descriptive statistics. Student t-test was used to compare the mean values of both groups. Analysis results with a P value below 0.05 were considered significant

Table 1. Student Feedback Form

1. The information provided about the method's process before the training was sufficient for me to understand the flow of the class correctly.
2. The lecture was well-organized, including the allotted time, the timing of breaks, the conduct of discussions, etc.
3. The physical environment in which the training took place was comfortable
4. The educator helped us understand different aspects of the subject through feedback, explanations, and discussions.
5. I believe that the instructor can contribute best to our learning with this method.
6. The instructor successfully managed the entire training process.
7. This instruction method increased my interest in the subject.
8. This instruction method helped me gain a good understanding of the subject.
9. I was able to maintain focus on the subject covered using this method for an extended period of time.
10. I actively participated in the learning process in this method.
11. I believe that the information acquired in this method will be more permanent.
12. Overall, I am satisfied with the implementation of this method.

Table 2. Knowledge Acquisition Exam

What is the name of the second part of the aorta?
What is the name of the first part of A. subclavia?
Which is the first and thickest branch of A. subclavia?
What name does A. subclavia get after it passes under the clavicle?
After which level does A. axillaris continue as A. brachialis?
Which of the following is the normal range of heart rate (heart rate/rate) in an adult when resting?
The pulse groove is located between the tendons of which of the following two muscles?
Which artery pulsation can be felt between spina iliaca anterior superior and tuberculum pubicum on the lig. inguinale?
Which arter can be pulsated on the dorsum of the foot?
Which of the following arteries' pulsation can be felt on fossa malleolus medialis?

RESULTS

This study took place in the context of the 4-year undergraduate nursing program at Akdeniz University Faculty of Nursing in the 2022-23 academic year. The research involved 109 first-term students who participated in both flipped classroom and classical lecture courses Those who did not attend any of these courses were excluded. The study aimed to assess whether flipped classroom activities compromised student satisfaction and knowledge acquisition compared to traditional lectures in human anatomy education.

In the study, two groups of first-term students were randomly assigned to either the flipped classroom or the traditional lecture approach for the subject “Anatomy of Peripheral Arteries.” The flipped classroom group watched two pre-recorded video lectures and participated in a 50-minute discussion session. The traditional lecture group attended a 50-minute in-person lecture on the same topic. Both groups received instruction from the same experienced faculty member.

Data collection involved a feedback form to measure student satisfaction and a knowledge acquisition exam with multiple-choice questions. Statistical analysis was conducted using IBM SPSS, calculating average scores and standard deviations. The student t-test was used to compare group mean values, with significance set at a P value below 0.05.

Table 3. Results of Other Studies in the Literature

Author and Year	Aim	Program	population	Data collecting	Analysis Method	Results
Geist et al. (2015) [8]	Evaluating the place of flipped classroom in knowledge acquisition	Pharmacology education in nursing education	Face to face training n = 40 Flipped training n = 46	Both groups took 3 unit tests and one final test during the semester.	The pre-test and post-test results were evaluated.	In all three unit tests, the flipped training group showed significantly more success than the other group ($p<0.05$). No significant difference was found in the final exam.
Harrington et al. (2015) [10]	Objectively comparing the learning outcomes of both groups	Pre-graduate medical and surgical nursing course	Face to face training n = 41 Flipped training n = 41	The performance of both groups was measured with 3 exams, 24 quizzes and 1 written essay.	explanatory and inferential statistics (t-tests, confidence interval, equivalence intervals MANKOVA)	No significant difference was found between the two groups.
Chu et al. (2019) [9]	Examining the effectiveness of flipped classroom	Evidence-Based Nursing Practice Course	Face to face training n = 75 Flipped training n = 76	An exam was administered to both groups before the course, after the course, and 1 month after the end of the course.	The results before and after the course and 1 month later were evaluated.	The knowledge of both groups increased after the course compared to before the course. The knowledge of the group trained with flipped classroomincreased more and was found to be significant. However, 1 month after the course, the rate of remembering information decreased in both groups.
Holman et al. (2016) [11]	Comparison of flipped classroom with traditional lecture	Pharmacology and psychiatric nursing courses in pre-graduate nursing education	Face to face training n = 119 Flipped training n = 117	A Likert scale questionnaire was applied to both groups at the end of the lesson. In addition, the final exam results were compared.	The results were evaluated with ANOVA one-way variant analysis.	The classroom with face-to-face education in the pharmacology course had higher results than the flipped classroom in the psychiatric nursing course. In the survey results, the overall satisfaction score in both courses was found to be higher in face-to-face education, but it was not considered significant. ($p > 0.05$)

The averages of the total student feedback scores for the classical lecture and flipped classroom were 45.9± 11.7 and 46.0± 8.5, respectively, and the difference between them was not statistically significant (student t-test, p=0.986). The mean of the knowledge acquisition test total scores were found to be 4.79 ± 1.62 and 4.82 ± 1.65, respectively, and the difference between them was not statistically significant (student t-test, p=0.872).

DISCUSSION

In this study, which was carried out to compare the flipped classroom and the classical lecture in terms of student satisfaction and knowledge acquisition levels, no difference was found between the two methods in terms of the parameters compared. Studies in the literature, a summary of which are presented in Table 2, generally found similar results.

In the study by Geist et al., in which both methods were compared in terms of knowledge gain in nursing pharmacology education, students in the flipped classroom group had higher short-term knowledge gains, while no difference was found between the two groups in a long-term comparison [8]. A similar result was obtained by Chu et al. in the Evidence-Based Nursing Practice Course, comparing the two methods [9]. In our study, however, no difference was found between short-term knowledge gains. A similar result was obtained in the study of Harrington et al. [10] There may be various reasons why there was no difference in short-term knowledge acquisition between classical lecture and flipped classroom in our study. The first of these may be related to the subject area, and the flipped classroom applied in an area such as anatomy that contains precise knowledge, producing thoughts on the underlying logic and mechanisms and learning activities by in-depth discussion may not have led to further knowledge gain. Or conversely, considering the characteristics of the field, it is possible for the students to have achieved the same knowledge gained with the classical lecture. The characteristics of the trainer can be considered as another factor. An experienced educator, who gives the classical lectures very effectively and uses interactive methods that can appeal to students with different learning styles during the class, may be adequately transferring the same information in both methods. The possibility that we focus on the most is the inadequacy of the students in fulfilling the requirements of the flipped classroom. If students do not watch the course material prepared for them in advance, the expected efficiency may not be obtained from the in-class meeting time, where no information is given directly and discussions are conducted instead.

Holman et al. compared classical and flipped classroom in pharmacology and psychiatric nursing courses in pre-graduate nursing education and they reported that students recognized multiple benefits of the flipped model, such as heightened engagement between instructors and students, better readiness, and an augmented learning experience [11]. In our study, there was no difference between the two methods in terms of student satisfaction. There are studies showing that students are more satisfied with learner-centered education methods where they actively participate in the lesson, share their opinions and questions with their peers and instructors, and have self-learning opportunities [12]. Flipped education is becoming more and more common all over the world [13], and there are various studies in the literature on this subject. Related to this, our expectation was that students would be more satisfied with flipped classroom, but our findings did not support this. We think there may be two reasons for this. The first one is about student behaviors. We think that students with different learning tendencies may benefit variously from flipped training. Green et al. showed that kinesthetic learners reported positive feelings about the flipped classroom model and visual learners reported negative feelings [14]. The students who attend the discussion session without preliminary preparation cannot participate in the discussions sufficiently, and the trainer does not give any direct information, only contributes to the discussions and puts the final point, so the students who come without preliminary preparation may perceive the process as chaotic. A similar outcome was found in a case study conducted by Herreid et al., according to the study students who are new to this approach might initially show reluctance since it entails them to complete tasks at home instead of being introduced to the subject matter during school hours. As a result, they might arrive unprepared for class, affecting their participation in the interactive learning segment of the course [15]. We think that as students' experience with flipped classroom increases, their satisfaction level will increase as they become more familiar with the method. The second reason is related to the characteristics of the trainer, and if the trainer has ensured the active participation of the students and kept their interest and motivation high by using interactive methods in the classical lecture course, then the satisfaction levels of the students with the classical lecture may have been as high as their satisfaction levels with the flipped classroom. Chen et al. found supporting findings as variations were likely to exist in the knowledge and skills of teachers who developed and conducted the FC activity, as well as in the nature and characteristics of the learning materials used before the class

[16]. Since we did not evaluate the engagement of the students with the class in this study, we cannot reach a definite judgment on this issue.

Lelean et al. also suggested that the studies they reviewed primarily focused on immediate post-implementation outcomes of the flipped classroom method, indicating a need for more longitudinal research to comprehend longer-term performance and knowledge retention effects. Many studies revealed that students lacked a comprehensive understanding of the flipped classroom's rationale and benefits due to insufficient explanations, suggesting a need for improved communication for future implementations [17].

Limitations

The first limitation of the study is related to generalizability, and the generalizability of the results obtained from a study conducted on a single subject with a limited number of students studying in one semester of a school is low. There is a need for studies on this subject with larger working groups and different subjects in different institutions.

The second limitation is related to the study plan, and the active participation of the students in the lesson was not evaluated in this study. If we were able to make this assessment, we would be able to understand whether there was indeed higher student participation in flipped classroom as expected.

The final limitation is related to the study plan, and the long-term knowledge retention was not evaluated in this study. It is thought that such an evaluation will provide important data in evaluating the effectiveness of any training method used.

CONCLUSIONS

Considering our findings, flipped classroom does not seem to compromise knowledge acquisition and student satisfaction, but it is not superior classical lectures. In order to obtain more reliable results, it is recommended to continue using the method and to plan and perform new studies considering the limitations of this study.

Informed Consent: Informed consent was obtained from the students participating in the research.

Conflict of Interest: The authors have no financial or other conflicts of interest to declare.

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