

Flipped Classroom Strategy Application as Perceived by Nursing Students

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Abstract

Background: Flipped classroom (FC) is a new pedagogical method in which the lecture and homework activities of a course are reversed. Students are required to review pre-recorded lectures before each class, and in-class hours are used for various learning activities, including open discussion, collaborative group activities, critical thinking activities, and hands-on activities. FC facilitates interaction between students and educators and between students themselves. This model encourages students to take the initiative in learning and allows them to study at their own pace.

Objective: This study aimed to assess FC strategy application as perceived by nursing students.

Settings: The study was carried out at Faculty of Nursing, Damanhour University, during the first semester throughout academic year 2022-2023. **Subjects:** A convenient samples of 450 third year nursing students enrolled in the Critical Care (1) course during the academic year 2022-2023. **Tools:** two tools were used. "Nursing students' perception toward the application of FC" and "Challenges toward the application of flipped classroom". **Results:** The results of this study showed that there were statistically significant differences between overall nursing students' perception before and after the application of the FC strategy.

Conclusion: FC is a promising alternative to traditional lectures in nursing education that solves the problem of an increased number of nursing students and a shortage of staff. Besides, it helps students become more engaged in the classroom. **Recommendations:** Implementation of the FC strategy in other courses and for students in different class levels will facilitate the learning process. Conduct more training workshops about FC for all nursing students and educators, especially the newly appointed.

Keywords: Flipped classroom, nursing students, perception.

Introduction

Education has been recognized as a fundamental right with far-reaching impacts on human development and social progress. Education is the cornerstone of sustainable development, and it contributes to building a modern society. Education also empowers communities and citizens to fully participate in development and prosperity. (Onojah et al., 2019)

The increasing development of digital technologies and their application in education facilitates new learning environments that offer students new web-based learning opportunities and resources. This rapid spread of interactive

technologies have facilitated the adoption of innovative approaches in higher education. It helps to promote collaborative learning, exploration, and research in online learning environments. (Soon Tan et al., 2022) In this line, the development of innovative student-centered approaches has encouraged educators to rethink educational processes to shift the focus from them to the students. Also, facilitate student participation and develop practical thinking. (Campillo-Ferrer & Miralles-Martínez, 2021) In many countries, classrooms are increasingly going online using a flipped learning approach. Particularly in light of a

change in the teaching arrangements due to the ongoing pandemic. (Ozkan Ozbay, 2021)

Flipped classroom strategy “is a setting where teaching that is traditionally done in class is now done at home, and that which is traditionally done as home work is now completed in class.” In other words, the flipped classroom strategy is a reversal of conventional learning procedures. Whereas, what is usually done in class is done at home as homework or homework done in class. That’s why this strategy is called reverse classroom learning, or flipped classroom.(Hu et al., 2018)

A flipped classroom can promote students’ active learning habits and develop student-centered learning environments. In which students engage actively by making self-evaluations and collaborate interactively in forms of group discussions and peer evaluations. Consequently, develop high-order thinking skills such as applying, analyzing, creating, and evaluating under an educator’s guidance and peer support. (Huynh et al., 2019)

The researcher faced the problem of increased student numbers in nursing faculty and a shortage of staff members during their experience with the faculty of nursing third-year students in critical care and emergency nursing departments. Leading to increasingly large lectures, and therefore decreasing interaction and collaboration. Which are important factors for individual learning success and satisfaction. Based on the background above, this study aimed to assess flipped classroom strategy application as perceived by nursing students as an alternative strategy to overcome the lack of face-to-face hours of this course and help students improve their nursing practice by utilizing more innovative strategies.

Aims of the Study

This study aimed to assess flipped classroom strategy application as perceived by nursing students.

Research hypotheses:

- Nursing students' mean scores regarding the perception of flipped classroom

application will be higher in post-program than pre-program scores.

Research question:

- What are the challenges to the application of flipped classroom among nursing students?

Materials and Method

Materials

Design: A quasi-experimental (one-group pretest/posttest) research design was used to conduct this study.

Settings: This study was conducted at the Faculty of Nursing, Damanhour University, during the first semester of the academic year 2022-2023.

Subjects:

The subjects in this study were comprised of 450 third-year nursing students enrolled in the Critical Care (1) course during the academic year 2022-2023 who accepted to participate in this study. The sample size was calculated using the Epi Info7 program based on the following information: Total population: 1123 students. Confidence level: 95%. The margin of error is 5%. The prevalence of the problem is 50%. Effect size: 1.5. Accordingly, the sample size was 450 students. The study sample was selected using the convenience method.

Tools: In order to collect the necessary data for the study, two tools were used:

Tool one: “Nursing students' perception toward the application of flipped classroom”. This tool was adapted by the researcher after a thorough review of the literature (Farah, 2014; Johnson, 2013; Johnson & Renner, 2012; Pavanelli, 2018; Yacout & Abou Shosha, 2016). This tool was used to assess the perception of nursing students toward the application of FC.

It consists of two parts:

Part I: Personal profile and academic data: consisted of 9 items.

Part II: Nursing students' perception toward FC: This part was composed of 38 items.

Scoring system:

The response to those items was scored on a three-point Likert scale (agree = 3, neutral = 2, disagree = 1). The scores of negatively worded items were reversed so that higher scores always represent the correct answer.

The total scoring system of nursing students' perception toward the application of FC ranged from 38-114 and it was interpreted as follows;

- 38-75 (<50%) indicated low nursing students' perception toward FC.
- 76-95 (50% - <75%) indicated moderate nursing students' perception toward FC.
- 96-114 (\geq 75%) indicated high nursing students' perception toward FC.

Tool two: "Challenges toward the application of flipped classroom":

This tool was adapted by the researcher after a thorough review of literature (Mkhymryahya et al., 2021). This tool was used to assess the challenges of nursing students toward the application of FC. The questionnaire was composed of 22 items, which were classified into two sections as follows:

Section I: Challenges related to students. This part was composed of 15 items.

Section II: Challenges related to administrative and technological factors. This part was composed of 7 items.

Scoring system:

The response to those items was scored on a three-point Likert scale (agree = 1, neutral = 2, disagree = 3).

The total scoring system of challenges toward the application of FC ranged from 22-66 it was interpreted as follow;

- 22-43 indicated high challenges toward FC.
- 44-54 indicated fair challenges toward FC.
- 55-66 indicated low challenges toward FC.

Method

An official permission to conduct the study was obtained from the Dean of the Faculty of Nursing, Damanhour University, and the Head of the Critical Care and Emergency Nursing Department. The validity of the tools was revised by a panel of five experts from faculty members in different nursing departments, and accordingly, the necessary modifications were made. Tool I was tested for its reliability by using Cronbach's alpha correlation coefficient test. The tool was proved to be reliable, where $r = 0.975$ for tool I (nursing students' perception toward the application of FC). A pilot study was carried out on 10% of the subjects who were excluded from the study to check and ensure the clarity of the items. The duration of data collection was nearly three months (from October to December 2022), as follows:

The study was conducted in three phases:

Phase I (planning): The students were divided into two main groups. The first group received clinical training on Saturday of each clinical rotation week, whereas the second group received clinical training on Tuesday of each clinical rotation week. The study subjects were the students in the skill laboratory who were selected from the Saturday and Tuesday groups using the convenience method. It consisted of eight groups from the Saturday group and eight groups from the Tuesday group. Each group consisted of 28 students, except for two groups, which consisted of 29 students each. WhatsApp groups were created for each group and supervised by the researcher and two teaching staff. On the second and third weeks of the skill laboratory rotation, the study subjects were assessed for their perception toward the application of flipped classroom by using tool 1 (pretest). Identify the aim of the research for the participants. A questionnaire was distributed to be answered by nursing students in 20 minutes, and the researcher responded to any questions raised by nursing students. On the **fourth** week of the skill laboratory rotation, two orientation sessions were done by the researcher for the study subjects at the end of the clinical day. The first session was for Saturday groups, and the second was for Tuesday groups. Each session lasted for about

30 minutes. For the purpose of increasing teaching staff and nursing students' knowledge and understanding of FC strategy. The researcher recorded a short video about the nasogastric feeding procedure on a doll in the skill laboratory. The video duration is about 15 minutes.

Phase II (implementation): Sending the video about the nasogastric feeding procedure to the study subjects through WhatsApp groups three days before the clinical day. Students were asked to watch the video several times, read more about the procedure, and be prepared for discussion and demonstration.

On the **fifth** week (Saturday and Tuesday groups), four groups from the study subjects. Two trained teaching staff for each group discussed the video content with the students and answered the students' questions about the procedure. Then each group was divided into two small subgroups of 14 students each. In which the researcher and teaching staff were observed and provided feedback to students during demonstration and redemonstration of the procedure.

On the **sixth, seventh, and eighth** weeks of the clinical rotation, the same process was repeated about the nasogastric feeding procedure, with the remaining 12 groups of students.

Phase III (evaluation): The students' evaluation was done by the researcher and the teaching staff, who supervised the targeted groups immediately after the implementation of the program. The researcher and the teaching staff distributed a questionnaire about nursing students' perception toward the application of FC "tool 1" and challenges toward the application of FC "tool 2" (posttest).

Ethical considerations

The research approval was obtained from the ethical committee at the Faculty of Nursing, Damanhour University, prior to the start of the study. The research code was 90-e, with the date 16/11/2023. A written informed consent was obtained from the study subject after an explanation of the aim of the study. Anonymity and confidentiality of the data were maintained. Right to withdraw from the study without any penalties in their clinical training grades.

Statistical Analysis

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0 (Armonk, NY: IBM Corp) Qualitative data were described using number and percent. The Kolmogorov-Smirnov test was used to verify the normality of distribution. Quantitative data were described using range (minimum and maximum), mean, standard deviation, median. Significance of the obtained results was judged at the 5% level.

Results

Table 1 presents the distribution of the nursing students according to their personal profile and academic data. It was found that the majority (93.8 %) of the students' age was more than 20 years old, while less than two thirds (63.6 %, 60.7 %) of them were female and in rural residence. Also, more than two thirds (68.2 %) of the students have Wi-Fi for internet connection, while above three quarters (82.9%) of them access the internet most of the time through their mobile phones. Moreover, regarding students' previous year academic degree, less than half (45.1%) were very good. The table also reveals that more than three quarters (83.6 %) of the students had previous FC experience. Moreover, less than half (45.6 %) of the student's last certificate was from secondary school.

Table 2 shows a comparison between the pre and post-tests of overall nursing students' perception toward the application of a flipped classroom. It was found that there was a statistically significant difference between overall nursing students' perception pre and post-test, where in pretest (low 40.4%, moderate 28.2%, and high 31.3%), whereas in the post-test (low 13.8%, moderate 34.2%, and high 52%) respectively, with $P < 0.001$. It was found that the scores increased after the implementation of the flipped classroom strategy.

Table 3 illustrates the distribution of the nursing students according to their challenges toward the application of FC in the post-test.

Regarding challenges related to students, the table reveals that less than half (44.7%) of the students agreed that they don't feel the seriousness of the topic when following the flipped classroom strategy, while less than one third (30%) of them disagreed. Also, more than half (55.8%) of the students agreed that a flipped classroom strategy leads to the formation of alternative concepts among students, while only 14.2% of them disagreed.

Moreover, less than half of the students agreed that the FC strategy suits a limited number of students. Frequent sitting in front of devices has negative effects on students. Also, they spend much time on social media rather than engaging in class activities (46%, 48.9%, and 44.9%) respectively. While less than a quarter (23.6%, 21.1%, and 23.3%) of them disagreed.

Regarding challenges related to administrative and technological factors, the table also reveals that, less than half (42.2%) of the students agreed that they didn't undergo general technical courses, while less than one third (30.2%) of them disagreed. Moreover, less than half of the students agreed that they had not been subjected to specialized courses related to this method. Lack of information and communication technology resources (low internet speed, lack of internet access at home, lack of laptops or mobile devices). Also, there are not enough specialists in the field who can help with the development (44.9%, 45.1%, and 43.8%) respectively. While one quarter (25.3%, 27.1%) and less than one third (31.8%) of them disagreed.

Table 4 illustrates the correlation between challenges and nursing students' perception after the application of FC. There was a significant negative correlation between nursing students' perception toward the application of FC and overall challenges ($p = 0.035$).

Table 5 reveals the relationship between nursing students' perception, and their personal profile and academic data. The results revealed that, more than two thirds (69.5%) of students who had a high perception to FC lived in rural areas compared to less than one third (30.5%) lived in urban areas.

Also, less than half (47.5%) of the students had a very good previous year academic degree. Also, regarding students' last certificate, more than one third (38.3%) were from secondary school. Moreover, students' place of residence, previous year academic degree, and last certificate were found to significantly affect the level of overall perception before the application of FC ($p = 0.012, 0.002$ and 0.005) respectively. The table also reveals that, more than two thirds (68.8%) of students who had a high perception of FC were female, compared to 31.2% of males. Also, less than three quarters (73.5%) of them have Wi-Fi for internet connections. Furthermore, the majority (87.2%) of the students have previous FC experience. Moreover, students' gender, type of internet connection and previous FC experience were found to significantly affect the level of overall perception after the application of flipped classroom ($p = 0.009, 0.043$ and 0.003) respectively. On the other hand, the table reveals an insignificant statistical difference between age, internet access device, and the overall level of students' perception before and after the application of FC.

Discussion

Innovative teaching approaches are required to prepare future nurses for practice. One such nursing education pedagogy that has received much attention is the flipped classroom. (Chen et al., 2020) FC is a hybrid approach, combining online learning and face-to-face classroom activities. In this pedagogical model, students engage in content learning before class, thereby maximizing in-class time for active learning. (Chen et al., 2019)

The findings of this study show that the majority of the students' ages were more than 20 years old, while less than two thirds of them were female and lived in rural areas. Moreover, less than half of them gained a very good score in the previous academic year. This finding was similar to Yacout & Abou Shosha (2016) who stated that less than three quarters of the students were female, the majority of them were above the age of 20,

and more than two thirds were living in rural areas. Moreover, regarding students' previous academic year achievement, more than half were very good.

Concerning the differences between nursing students' perception toward the application of FC during different program phases. The result revealed that there was a statistically significant difference between the pre and post program. Clearly, the total mean score elevated post-program implementation higher than the pre-program mean score. Therefore, this finding supported the research hypothesis.

The post-program results could be related to the fact that the participants enjoyed learning through video material, which gave them the chance to learn at their own speed and with the flexibility conveyed by the available video lectures. Also, learning is effortless and more successful within the structure of FC.

This finding was aligned with Angadi et al., (2019) who stated that there was a significant difference between the pre and posttest scores. The students' perception regarding FC was also evaluated, and the majority of them strongly agreed that FC was more engaging and interesting in comparison to traditional classes. More than three quarters of them strongly agreed that more such classes should be conducted in the future.

These findings were contradicted with Chan et al., (2020) who found that there was a low degree of acceptance and unfavorable impressions of FC among students. Also, about half of the students perceived FC as not effective, and the majority expressed a negative impression towards FC. This contradiction may be attributed to the inappropriate use of flipped classroom and the increase in student workload. Also, their perceived usefulness and intention to register in flipped classroom.

On investigating challenges toward the application of FC in post program, and concerning challenges related to students, the current study revealed that less than half of the students agreed that they don't feel the seriousness of the topic when following FC

strategy. Also, more than half of the students agreed that the FC strategy leads to the formation of alternative concepts among students. Moreover, less than half of the students agreed that the FC strategy suits a limited number of students, as well as frequent sitting in front of devices has negative effects on students. Moreover, they spend much time on social media rather than engaging in class activities. Possible reasons for these findings include the students having to study by themselves, having difficulty with complex topics, being accustomed to conventional learning in traditional learning settings, and having different learning styles.

Similar findings were reported by Lee & Tan, (2020) who revealed that some participants mentioned that they found it difficult to take responsibility for their own learning at home because of many distractions (as social media), which may cause them to lose concentration. Moreover, FC requires students to do out-of-class activities such as watching instructional videos and doing online quizzes before coming to class. Also, more than one third of them agreed that this method was suitable for a small number of students.

Moreover, regarding challenges related to administrative and technological factors, the present study revealed that less than half of the students agreed that they didn't undergo general technical courses. Also, less than half of the students agreed that they had not been subjected to specialized courses related to this method, and there was a lack of information and communication technology resources (low internet speed, lack of internet access at home, and lack of laptops or mobile devices). Moreover, there are not enough specialists in the field who can help with the development.

This may be due to the expansion of the content, problems with the internet, the negative involvement of some classmates, or the way of learning the subject matter and having to study it without receiving a previous explanation. Thus, some of them preferred a traditional teaching method and a theoretical explanation in the classroom. mainly because it is more useful to have the handouts explained.

These findings were congruent with Shanmugapriya et al., (2023) who reported that the majority of the students disagreed that they were able to access Wi-Fi/internet connections at their college campus and university even though access was available. Also, the majority of them disagreed that the colleges provided the necessary resources for FC access. Also, more than half of them expressed that it would be convenient if an online platform could be used to interact with the educators and classmates. More than half of the students agreed that they needed training courses to engage in FC effectively.

These findings were inconsistent with Yeh, (2022) who reported that the majority of the participants had a positive view of the digital tools used in FC, considering them “innovating and far from the past.” Also, most of the students used electronic devices with internet connections. As well, there was a high tendency toward the use of mobile devices, such as laptops, smartphones, and tablets, to browse the internet in the search for information.

Regarding the correlation between challenges and nursing students' perception after the application of FC, there was a significant negative correlation between nursing students' perception toward the application of FC and overall challenges. This means that after the application of FC, students achieved a higher perception of FC on the other hand, achieved a low level of challenge. The increase in the perception of the students could be due to FC being a more constructive and motivational method for them.

The current study was congruent with Putsch, (2018) who found that there was a negative correlation between students' attitudes and FC barriers. Furthermore, these results were in agreement with El-Sheikh & El-Sayad, (2019) who revealed that the study group achieved a higher level of perception towards FC after the first aid unit. On the other hand, more than half of the students achieved low challenges toward FC.

In attempting to deeply explain and support the current research finding, the investigator

has examined the relationship between nursing students' perception toward the application of FC, and their personal profile and academic data. The current study results indicated the presence of a statistically significant relationship between nursing students' perception toward the application of FC in relation to study subjects' personal profile and academic data regarding their; place of residence, previous year's academic degree, and last certificate in the preprogram phase.

Also, students' gender, type of internet connection, and previous FC experience were found to significantly affect the level of overall perception after the application of FC. It was found that more than two thirds of students who had a high perception toward the application of FC were female. The current study was supported by Naser & Taufiq (2020) who pointed out that there was a significant difference between perception of FC and gender.

Oppositely, Hao (2021) found that individual characteristics of gender and academic status did not influence students' perspectives toward FC. This contradiction may be attributed to the fact that the female social perception in Damanshour as a rural community prefers to be at home studying as compared to males, so they have the opportunity to learn more by using different methods.

Conclusion

A flipped classroom is a promising alternative to traditional lectures in nursing education, that solves the problem of an increased number of nursing students and a shortage of staff. Besides, it helps students become more engaged in the classroom.

Recommendations

In line with the findings of the study, the following recommendations are made:

- Implementation of the flipped classroom strategy in other courses and for students in different class levels to facilitate the learning process.

- Conduct more training workshops about FC for all nursing students and educators, especially the newly appointed.

Table (1): Distribution of the nursing students according to their personal profile and academic data (n = 450)

Part 1: personal profile and academic data	No.	%
Age (years)		
Less than 20	28	6.2
More than 20	422	93.8
Gender		
Male	164	36.4
Female	286	63.6
Place of residence		
Urban	177	39.3
Rural	273	60.7
Type of internet connection		
Mobile data	143	31.8
Wi-Fi	307	68.2
You can access internet most of time through		
Personal computer	33	7.3
Mobile phone	373	82.9
Friends' computer	5	1.1
More than one device	39	8.7
In case of you don't have internet access at home, you can use		
Cyber	36	8.0
Friends / relative	188	41.8
Faculty library	13	2.9
Not applicable	213	47.3
Previous year academic degree		
Excellent	97	21.6
Very good	203	45.1
Good	149	33.1
Fair	1	0.2
Do you have previous flipped classroom experience?		
Yes	376	83.6
No	74	16.4
Last certificate		
Secondary school	205	45.6
Health technical institute	116	25.8
Technical institute of nursing	129	28.7

Table (2): Comparison between pre and posttest of overall nursing students' perception toward the application of flipped classroom (n = 450)

Overall nursing students' perception	Pretest		Posttest		Test of Sig.	P
	No.	%	No.	%		
Low (<50%)	182	40.4	62	13.8	MH= 524.0*	<0.001*
Moderate (50% - < 75%)	127	28.2	154	34.2		
High (≥75%)	141	31.3	234	52.0		
Total Score					Z= 9.409*	<0.001*
Min. – Max.	40.0 – 112.0		44.0 – 112.0			
Mean ± SD.	78.56 ± 21.82		91.88 ± 15.01			
Median	81.0		95.0			
% Score						
Min. – Max.	2.63 – 97.37		7.89 – 97.37			
Mean ± SD.	53.36 ± 28.71		70.89 ± 19.74			
Median	56.58		75.0			

SD: Standard deviation Z: Wilcoxon signed ranks test
 MH: Marginal Homogeneity Test
 p₁: p value for comparing between Pre and Post
 *: Statistically significant at p ≤ 0.05

Table (3): Distribution of the nursing students according to their challenges toward the application of flipped classroom in posttest (n = 450)

	Challenges toward the application of flipped classroom:	Agree		Neutral		Disagree	
		No.	%	No.	%	No.	%
A.	Challenges related to students:						
1	I don't feel the seriousness of the topic when following flipped classroom strategy.	201	44.7	114	25.3	135	30.0
2	Flipped classroom strategy leads to the formation of alternative concepts among students.	251	55.8	135	30.0	64	14.2
3	Flipped classroom strategy suits a limited number of students.	207	46.0	137	30.4	106	23.6
4	Frequent sitting in front of devices has negative effects on students.	220	48.9	135	30.0	95	21.1
5	I spend much time on social media rather than engaging in class activities.	202	44.9	143	31.8	105	23.3
B.	Challenges related to administrative and technological factors:						
6	I didn't undergo general technological courses.	190	42.2	124	27.6	136	30.2
7	I have not been subjected to specialized courses related to this method.	202	44.9	134	29.8	114	25.3
8	Lack of information and communication technology resources (low internet speed, lack of internet access at home, lack of laptops or mobile devices).	203	45.1	125	27.8	122	27.1
9	There are not enough specialists in the field, who can help with the development.	197	43.8	110	24.4	143	31.8

Table (4): Correlation between challenges and nursing students' perception after the application of flipped classroom (n = 450)

Items of correlation	Nursing students' perception	
	r _s	p
Challenges related to students	-0.113*	0.016*
Challenges related to administrative and technological factors	-0.064	0.175
Overall challenges	-0.099*	0.035*

r_s: Spearman coefficient

*: Statistically significant at p ≤ 0.05

Table (5): The relationship between level of nursing students' perception and their personal profile and academic data (n = 450)

Personal profile and academic data	Level of overall nursing students' perception											
	Pretest						Posttest					
	Low (n = 182)		Moderate (n = 127)		High (n = 141)		Low (n = 62)		Moderate (n = 154)		High (n = 234)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Age (years)												
Less than 20	15	8.2	7	5.5	6	4.3	2	3.2	10	6.5	16	6.8
More than 20	167	91.8	120	94.5	135	95.7	60	96.8	144	93.5	218	93.2
χ²(p)	2.317 (0.314)						1.125 (0.570)					
Gender												
Male	74	40.7	49	38.6	41	29.1	20	32.3	71	46.1	73	31.2
Female	108	59.3	78	61.4	100	70.9	42	67.7	83	53.9	161	68.8
χ²(p)	4.950 (0.084)						9.294* (0.009*)					
Place of residence												
Urban	85	46.7	49	38.6	43	30.5	25	40.3	56	36.4	96	41.0
Rural	97	53.3	78	61.4	98	69.5	37	59.7	98	63.6	138	59.0
χ²(p)	8.787* (0.012*)						0.875 (0.646)					
Type of internet connection												
Mobile data	52	28.6	40	31.5	51	36.2	23	37.1	58	37.7	62	26.5
Wi-Fi	130	71.4	87	68.5	90	63.8	39	62.9	96	62.3	172	73.5
χ²(p)	2.123 (0.346)						6.280* (0.043*)					
You can access internet most of time through												
Personal computer	13	7.1	8	6.3	12	8.5	5	8.1	12	7.8	16	6.8
Mobile phone	149	81.9	108	85.0	116	82.3	51	82.3	127	82.5	195	83.3
Friend computer	2	1.1	1	0.8	2	1.4	2	3.2	1	0.6	2	0.9
More than one device	18	9.9	10	7.9	11	7.8	4	6.5	14	9.1	21	9.0
χ²(MCp)	1.492 (0.973)						3.298 (0.762)					
In case of you don't have internet access at home, you can use												
Cyber	15	8.2	11	8.7	10	7.1	3	4.8	13	8.4	20	8.5
Friends / relative	73	40.1	52	40.9	63	44.7	19	30.6	75	48.7	94	40.2
Faculty library	3	1.6	5	3.9	5	3.5	3	4.8	5	3.2	5	2.1
Not applicable	91	50.0	59	46.5	63	44.7	37	59.7	61	39.6	115	49.1
χ²(p)	2.822 (0.831)						10.222 (MCp= 0.103)					
Previous year academic degree												
Excellent	51	28.0	14	11.0	32	22.7	14	22.6	30	19.5	53	22.6
Very good	67	36.8	69	54.3	67	47.5	22	35.5	73	47.4	108	46.2
Good	63	34.6	44	34.6	42	29.8	26	41.9	51	33.1	72	30.8
Fair	1	0.5	0	0.0	0	0.0	0	0.0	0	0.0	1	0.4
χ²(MCp)	18.527* (0.002*)						5.191 (0.530)					

Do you have previous flipped classroom experience?												
Yes	156	85.7	103	81.1	117	83.0	43	69.4	129	83.8	204	87.2
No	26	14.3	24	18.9	24	17.0	19	30.6	25	16.2	30	12.8
$\chi^2(p)$	1.208 (0.547)						11.341* (0.003*)					
Last certificate												
Secondary school	101	55.5	50	39.4	54	38.3	28	45.2	77	50.0	100	42.7
Health technical institute	34	18.7	42	33.1	40	28.4	12	19.4	45	29.2	59	25.2
Technical institute of nursing	47	25.8	35	27.6	47	33.3	22	35.5	32	20.8	75	32.1
$\chi^2(p)$	14.825* (0.005*)						8.090 (0.088)					

χ^2 : Chi square test

MC: Monte Carlo

*: Statistically significant at $p \leq 0.05$

p: p value for Relation between nursing students' perception and personal profile and academic data

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