Effect of flipped learning-based smoking cessation intervention education program for nursing students in South Korea

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Purpose: The goal of this study was to see how flipped learning affected nursing students in South Korea who were enrolled in a quit smoking intervention education program. The flipped learning-based quit smoking intervention education program was developed to help nursing students implement the intervention. **Methods:** This quasi-experimental study was conducted using a pretest-posttest design. A total of 52 nursing students, divided into experimental and control groups of 26 each, participated between November and December 2021. The experimental group was instructed in the flipped learning-based quit smoking intervention education program over six sessions. In accordance with flipped learning, each session was composed of pre-class, in-class, and post-class sections. **Results:** Compared to the control group, the experimental group showed improved beliefs about the health benefits of quitting smoking, as well as positive attitudes and self-efficacy from the quit smoking intervention. The experimental group experienced the greatest increase in student-centered activities and student participation through flipped learning. **Conclusion:** These results indicate that the flipped learning method was effective in quit smoking intervention education for nursing students. Therefore, it is worthwhile to consider that a quit smoking intervention education program based on flipped learning be included in the regular nursing curriculum.

Keywords: Nursing, Students, Learning, Smoking cessation

Introduction

Although smoking rates have dramatically declined in many industrialized nations, Korea's male smoking rate is still higher than the average of the 34 nations in the Organization for Economic Cooperation and Development (OECD) [1,2]. As a result, in compliance with the World Health Organization (WHO) Framework Convention on Tobacco Control (FCTC), the Korean government has created a variety of smoking cessation support services [3]. Article 14 of the FCTC recommends capacity building for all healthcare professionals through the formation of regular educational courses on quitting smoking interventions [4].

Smokers are more likely to be seen and advised by healthcare practitioners who have attended quit smoking training than those who have not [5]. In Australia, the United Kingdom, and the United States, medical schools and dental, pharmacy, and nursing colleges implement quit smoking education courses that include contents tailored for each profession [6]. However, in Korea, the content of quit smoking education in the regular courses of medical schools is insufficient. In addition, the ratio of quit smoking content in Korea's nursing education curriculum is lower than that in other Asian regions and was found to be insufficient for implementing quit smoking interventions in the field [6,7].

Nursing students will, as a matter of course, be future nurses, and quit smoking education can help them take on more responsibility while also enhancing their knowledge and ability to help patients quit smoking [8]. The WHO thus recommends quit

smoking education as a mandatory part of nursing schools [9]. As quit smoking education requires various skills and practices, many studies have used various methods to design and develop quit smoking intervention education programs for nursing students, such as blended and simulation-based methods [10,11]. These studies indicate that for a quit smoking intervention education program aimed at nursing students, a variety of evidence-based education methods are required rather than the existing traditional lecture methods.

Flipped learning, also known as "an upside-down classroom," is a method in which students do at school what they traditionally do at home as homework assignments, first watching the core contents of what they will do at school in videos at home [12]. The flipped classroom has been examined as part of an effort to engage students as active learners by offering rich and powerful learning experiences that prepare them to practice in rapidly changing healthcare environments [13,14]. Therefore, it is thought that this method can solve the problems of the insufficient aspects of quit smoking intervention education－a lack of time and quality [6].

In various prior studies on the smoking cessation intervention performance factors of nurses and nursing students, the higher their beliefs about the health benefits of quitting smoking and the higher the self-efficacy of the smoking cessation intervention, the higher their intention to implement quit smoking interventions. In addition, it was found that the more positive their attitude toward smoking cessation intervention was, the more often they performed smoking cessation interventions [15,16]. Therefore, we intend to use the flipped learning method since it has been shown to be more effective than traditional teaching methods for nursing students in beliefs about the health benefits of quitting smoking, attitude toward quit smoking interventions and self-efficacy concerning quit smoking interventions [17].

Kang [18] found that a quit smoking intervention education program applied with flipped learning improved the smoking cessation competency of the general public who were interested in the intervention. However, in Korea, there are only studies that have evaluated the effectiveness of a smoking cessation intervention education program for nursing students employed programs that consisted of theoretical education and practice with face-to-face and blended learning educational methods [10,19].

Therefore, this study is deemed necessary to evaluate the effect of flipped learning as an educational method for developing a quit smoking intervention education program for nursing students and to provide basic data on educational content and methods for such a program when it is to be included in the regular nursing curriculum.

Purpose of Study

This study aimed to apply a flipped learning-based quit smoking intervention education program for nursing students and to verify its effects.

The Study's Hypotheses

- The experimental group would have a higher degree of beliefs about the health benefits of quitting smoking than the control group after completing a flipped learning-based quit smoking intervention education program.
- The experimental group would have a higher degree of attitude toward quit smoking interventions than the control group.
- The experimental group would have a higher degree of self-efficacy concerning quit smoking interventions than the control group.

Methods

Study Design

This was a quasi-experimental study with a pre-posttest nonequivalent control group.

Sample and Setting

The participants of this study were second-year nursing students who were attending two nursing colleges in B city, had never received any smoking cessation intervention education, and had agreed to participate voluntarily. For assigning participants, the two colleges were convenience sampled as an experimental group and a control group, respectively, in order to prevent the effect of diffusion between participants. Prior to the first session, baseline data were obtained, and once the program was finished, post-intervention data were collected. Based on past studies, the sample size for the effectiveness of a quit smoking intervention education program was estimated [10]. The criteria for two-sided independent t-tests included statistical power $(1-\beta)=.80$, significance level $(\alpha)=.05$, and effect size $(f)=.80$. It was indicated

that we required 52 participants (26 per group). We considered a 15% drop-off rate and recruited 60 people with 30 each in the experimental and control groups. In the experimental group, two participants dropped out due to insincere responses to the questionnaire and two participants dropped out due to personal reasons. In the control group, four participants dropped out due to personal reasons (dropout rate 13.3%). Finally, data from 26 participants in each group were analyzed.

Measurements

● General characteristics of the participants

The participants' general characteristics, which included gender and age, were assessed. Health-related characteristics, such as the amount of regular exercise per week, drinking status, smoking status, family smoking status, and how many times breakfast was skipped per week, were collected.

● Beliefs about the health benefits of quitting smoking

Beliefs about the health benefits of quitting smoking were determined by asking the participants if they thought quitting smoking would help avoid or reduce serious health problems (e.g., quitting smoking reduces your chances of getting lung cancer). This study used the scale developed by Sohn et al. [11] and translated into Korean by Choi and Kim [16]. This scale has six items that are scored on a 5-point Likert scale ranging from "strongly disagree" (1 point) to "very satisfied" (5 points). The higher the score, the more positive the beliefs in the health benefits of quitting smoking. Cronbach's α were .80 and .83 in a previous study [16] and in the present study, respectively.

● Attitude toward quitting smoking interventions

The attitude toward quitting smoking interventions assessed whether that attitude was positive (e.g., It is important for nurses to provide routine smoking cessation advice to patients who smoke; smoking cessation programs would be useful in hospitals.). This study used the tool developed by Macnally et al. [20] and translated into Korean by Choi and Kim [16]. This scale comprises eight items that are scored on a 5-point Likert scale ranging from "strongly disagree" (1 point) to "very satisfied" (5 points). Cronbach's α were .84, .88, and .80 at the time of tool development [20], in Choi and Kim's study [16], and in the present study, respectively.

● Self-efficacy of quitting smoking interventions

Self-efficacy of quitting smoking interventions was measured using the tool, self-efficacy of smoking cessation intervention using the 5A (Ask, Advise, Assess, Assist, Arrange)'s strategy (e.g., can help patients on nicotine replacement therapy, can advise every patient who smokes to quit smoking), developed by Sohn et al. [11] and revised by Song and Kim [21]. This scale comprises nine items that are rated on a 5-point Likert scale, which range from "strongly disagree" (1 point) to "very satisfied" (5 points). Cronbach's α were .86, .85, and .89 at the time of tool development [11], in a study by Song and Kim [21], and in this study, respectively.

● Satisfaction with flipped learning

Satisfaction with flipped learning was measured via 10 items which were rated on a 5-point Likert scale that ranged from "strongly disagree" (1 point) to "very satisfied" (5 points). Hong [22] constructed these items to evaluate the effectiveness of flipped learning. The scale content includes self-directed learning ability, learning motivation, creativity, student-centered activities, student participation in learning, student-student interaction, professor-student interaction, improvement in understanding and complete learning potential, and the possibility of replacing professor lectures with video viewing. The satisfaction with flipped learning measure was posed only to the experimental group, and in addition to answering its 10 questions, they were allowed to freely give their opinions on the good points of flipped learning and the things about it that could be improved.

Intervention

The flipped learning-based quit smoking intervention education program aimed to advance the intervention capacities of nursing students to assist smokers in stopping smoking. The experimental group participated in the program from November 1, 2021 to December 6, 2021 for a total of 6 sessions. The teaching-learning strategy was designed according to the Pre-In-Post class, the operation model of Kan and Jung [23]. In the pre-class stage, pre-learning materials are provided before the class so that learners can study them in a self-directed learning environment. In this study, students were notified of the unit to be covered in the corresponding class in advance so that they could pre-learn the learning content online.

The in-class stage provides opportunities to apply various team

activities based on previously-learned content [23]. In this study, real-time video classes through ZOOM (Zoom Video Communications, San Jose, California, USA) and face-to-face classes were conducted, the level of understanding was checked through quizzes, the contents were organized and reviewed, and learning was applied through discussions and activity sheets. In the post-class stage, how well after the class its content was comprehended is evaluated. In this study, the learner was asked to write a reflection journal to check their comprehension, and the researcher provided feedback online before the next session (Table 1).

For the control group, a pretest was conducted at the same time as for the experimental group, and a posttest was conducted six weeks after the intervention of the experimental group was finished. After the control group's posttest survey was completed, relevant data were provided to the control group interested in the flipped learning-based quit smoking intervention education program, and they were informed that there would be an opportunity for them to participate in the program.

Table 1. Contents of Flipped Learning-based Quitting Smoking Intervention Education Program

Session		Content	Duration (minute)
1	Pre-class	• Tobacco control strategy • Smoking and health • Smoking and health practices • Understanding new tobacco	53.15
	In-class	• Content review through quiz • Discuss the case by group through the learning contents	60.00
	Post-class	• Write a reflection journal and give feedback	
2	Pre-class	• Tobacco use disorder • Smoking cessation drug therapy • Oral drug therapy	43.76
	In-class	• Content review through quiz • Discuss the case by group through the learning contents	60.00
	Post-class	• Write a reflection journal and give feedback	
3	Pre-class	• Special group smoking cessation counseling - recurrent smokers • Special group smoking cessation counseling - youth	32.57
	In-class	• Content review through quiz • Discuss the case by group through the learning contents	60.00
	Post-class	• Write a reflection journal and give feedback	
4	Pre-class	• Smoking cessation counseling techniques • Smoking cessation counseling course • Special group smoking cessation counseling-women and pregnant women	50.40
	In-class	• Content review through quiz • Listen to smoking cessation counseling by group and analyze the contents of the counseling	60.00
	Post-class	• Write a reflection journal and give feedback	
5	Pre-class	• Smoking cessation behavior therapy • Special group smoking cessation counseling- Psychological changes related to smoking and quitting smoking	48.35
	In-class	• Content review through quiz • Establishing a smoking cessation intervention plan according to the target case	60.00
	Post-class	• Write a reflection journal and give feedback	
6	Pre-class	• 5A's & 5R's smoking cessation counseling • Smoking prevention and smoking cessation education	40.76
	In-class	• Content review through quiz • Role-play smoking cessation counseling in groups	60.00
	Post-class	• Write a reflection journal and give feedback	

5A=ask, advice, assess, assist, arrange; 5R=relevance, risks, rewards, roadblocks, repetition

Data Analysis

The SPSS 27.0 statistics program(IBM Corp., Armonk, NY, USA) was used to analysis the data. Participants' general and health-related characteristics were analyzed using frequencies, percentages, means, and standard deviations. A chi-squared test, independent t-test, and Fisher's exact test were used to verify the pretest homogeneity between the two groups. A t-test of the mean differences (posttest minus pretest scores) was used to compare the effects of the flipped learning-based quit smoking intervention education program between the two groups. The statistical significance level was set at $p<.05$, and the reliability of the tool was calculated via Cronbach's α coefficient.

Ethical Considerations

The Pukyong National University Institutional Review Board gave their approval to this study (Approval no. IRB No.1041386 -202111-HR-65-02). The study's participants were nursing students who agreed to participate voluntarily, understood the study's goal and procedures, and signed a consent form. All participants were offered a small compensation, and the control group was provided with information regarding the flipped learning-based quit smoking intervention education program after the study period.

Results

Homogeneity of the General Characteristics and Main Variables of the Participants

In terms of general characteristics, the experimental and control groups were determined to be homogeneous, as indicated in Table 2. In addition, no significant differences were revealed in the main variables, such as beliefs about the health benefits of quitting smoking and their attitudes toward and self-efficacy of quitting smoking interventions, between the two groups (Table 2).

Table 2. Homogeneity Test of General Characteristics and Main Variables between Two Groups (N=52)

Characteristics	Categories	Total (n=52) n (%)/Mean±SD	EG (n=26) n (%)/Mean±SD	CG (n=26) n (%)/Mean±SD	x^2/t	p
General characteristics						
Gender	Women	40 (76.9)	20 (76.9)	20 (76.9)		
	Men	12 (23.1)	6 (23.1)	6 (23.1)		
Age (year)		21.60±0.87	21.38±0.70	21.81±0.98	-1.79	.080
Regular exercise (per week)	≥3	6 (11.5)	2 (7.7)	4 (15.1)	3.72	.173*
	1~2	19 (36.5)	7(36.9)	12 (46.2)		
	No	27 (51.9)	17(65.4)	10 (38.5)		
Drinking status (per week)	≥3	3 (5.8)	0.0	3 (10.0)	2.83	.355*
	1~2	23 (44.2)	12 (46.2)	11 (42.3)		
	No	26 (50.0)	14 (53.8)	12 (46.2)		
Smoking status	Current	5 (9.6)	1 (3.8)	4 (15.4)	2.01	.576*
	Past	5 (9.6)	3 (11.5)	2 (7.7)		
	Never	42 (80.8)	22 (84.6)	20 (76.9)		
Family smoking status	Yes	28 (53.8)	14 (53.8)	14 (53.8)		
	No	24 (46.2)	12 (46.2)	12 (46.2)		
Skipping breakfast (per week)	≥3	39 (75.0)	22 (84.6)	17 (65.4)	2.85	.199*
	1~2	12 (23.1)	4 (15.4)	8 (30.8)		
	No	1 (1.9)	0.0	1 (3.8)		
Main variables						
Beliefs about health benefits		26.40±3.21	27.23±2.34	25.58±3.75	1.90	.062
Attitude		32.00±4.45	33.00±3.86	31.00±4.84	1.65	.106
Self-efficacy		36.08±6.56	37.58±5.53	34.58±7.25	1.68	.100

CG=control group; EG=experimental group; M=mean; SD=standard deviation
*Fisher's exact test

Hypotheses Tests

Hypothesis 1. "The experimental group would have a higher degree of beliefs about the health benefits of quitting smoking interventions than the control group" was supported, as there was a statistically significant difference ($t=3.18$, $p=.003$) in the beliefs about the interventions' health benefits between the two groups.

Hypothesis 2. "The experimental group would have a higher degree of attitude toward quitting smoking interventions than the control group" was supported, as there was a statistically significant difference ($t=3.81$, $p=<.001$) in this attitude between the two groups.

Hypothesis 3. "The experimental group would have a higher degree of self-efficacy concerning quitting smoking interventions than the control group" was supported, as there was a statistically significant difference ($t=3.07$, $p=.003$) in this self-efficacy between the two groups (Table 3).

Satisfaction in and Evaluation of the Flipped Learning-based Quit Smoking Intervention Education Program in the Experimental Group

Table 4 provides the satisfaction analysis results for the experimental group's flipped learning program. The average score for each question was 4.31 to 4.85 points, and the overall average score was 4.62 points. The items with the highest level of satisfaction were "flipped learning increased student-centered activities" and "flipped learning increased students' participation in learning." The item with the lowest score was "pre-viewing a video of flipped learning could replace a professor's lecture."

The results of freely describing the advantages of flipped learning included the following:

In terms of performance, it was reported that it was helpful for increased understanding, creativity, self-directed learning, and long-term memory. In terms of method, it was said to be convenient to be able to take online lectures at any time, and it was reported that class activities such as discussions were more

Table 3. Effects of Flipped Learning-based Quitting Smoking Intervention Education Program on Dependent Variables

(N=52)

Variables	Group	Pretest	Posttest	t	p	Difference	t	p
		Mean±SD	Mean±SD			Mean±SD		
Beliefs about health benefits	EG (n=26)	27.23±2.34	28.46±2.00	3.19	.004	1.23±1.97	3.18	.003
	CG (n=26)	24.50±3.49	25.58±3.75	1.75	.092	-1.08±3.14		
Attitude	EG (n=26)	33.00±3.86	37.77±2.10	6.46	<.001	4.77±3.77	3.81	<.001
	CG (n=26)	31.00±4.84	31.54±4.51	0.65	.523	0.54±4.24		
Self-efficacy	EG (n=26)	37.58±5.53	43.42±1.86	5.51	<.001	5.85±5.40	3.07	.003
	CG (n=26)	34.58±7.25	35.50±6.28	0.77	.451	0.92±6.15		

CG=control group; EG=experimental group; M=mean; SD=standard deviation

Table 4. Satisfaction about Flipped Learning of Experimental Group

(N=26)

Items	Mean±SD
1. Flipped learning improves self-directed learning ability	4.54±0.58
2. Flipped learning improves learning motivation	4.38±0.75
3. Flipped learning improves creativity	4.42±0.76
4. Flipped learning increases student-centered activities	4.85±0.37
5. Flipped learning increases student participation in learning	4.85±0.46
6. Flipped learning increases student interaction	4.65±0.69
7. Flipped learning increases the interaction between professors and students	4.73±0.60
8. Flipped learning increases comprehension of learning content	4.81±0.40
9. Flipped learning boosts the possibility of perfect learning	4.69±0.62
10. Pre-viewing the video of flipped learning can replace professor lectures	4.31±1.05

M=mean; SD=standard deviation

active. An area that was reported to need improvement in flipped learning was that of content connectivity, with the time interval between pre-class and in-class needing to be reduced.

Discussion

This study provides valuable information showing that a flipped learning-based quit smoking intervention education program is effective in encouraging beliefs about the health benefits of quitting smoking and strengthening the attitudes toward and self-efficacy of such interventions for nursing students. Moreover, this study was meaningful because it applied a new education method rather than an existing one, evaluated its effects, and established a basis for standardized nursing education for quit smoking interventions.

The results of the present study indicate that, in the experimental group who received the flipped learning program, beliefs about the health benefits of quitting smoking were much greater than in the control group. It is difficult to make an accurate comparison since no previous studies evaluated the effectiveness of a quit smoking intervention education program on the students' beliefs about the health benefits of quitting smoking. However, our findings were consistent with earlier research that found that nursing students' intention to help patients quit smoking was significantly influenced by their beliefs about the health benefits of quitting smoking [21]. In addition, Han and Shin [24] reported that through flipped learning, learners widened their thinking, modified their perceptions, and tended not to forget what they had learned. The increase in beliefs about the health benefits of quitting smoking after the program utilized in this study was considered to be a natural increase as the students were exposed to various research results and positive changes in people's bodies after they quit smoking, as seen via video data and direct discussions.

The experimental group's attitude toward the quit smoking intervention was significantly better compared to the control group's. A previous study also showed a significant difference in attitude towards physical therapy in an experimental group that was instructed via flipped learning [25]. Karadag and Keskin [26] reported that the flipped learning approach positively affected students' attitudes towards math. The present study findings are consistent with those of these past studies. Students who participated in flipped learning valued the greater application of concepts and real-world practices that it provided through classroom activities and assignments [27]. In this study, the role of the nurse was emphasized to the experimental group through the program. Furthermore, it seemed that the attitude toward quit smoking interventions was improved by performing such interventions from the perspective of an actual nurse in role-plays.

In comparison to the control group, the experimental group's self-efficacy in the quit smoking intervention was much higher. These results were consistent with those of a previous study on the effect of quit smoking education on the helping behavior of nursing students, which reported that students' knowledge and self-efficacy regarding quitting smoking interventions dramatically improved after an educational program [28]. In a systematic review and meta-analysis study of 21 research on flipped learning applied to university students in Korea, flipped learning boosted their sense of efficacy [29]. In this study, it was thought that the self-efficacy of nursing students was improved via self-directed quit smoking intervention practice based on the knowledge that students demonstrated during class, revealing that the learning contents were grasped in advance through the flipped learning method.

This research is significant because it offers practical advice on the content and techniques of a flipped learning-based quit smoking intervention education program for nursing students. Unlike conventional education methods, flipped learning emphasizes activities before and during class. As a result, before classes, educators will devote the majority of their time on more meaningful learning, such as workshops or dialogues [30]. Hence, training for educators regarding flipped learning programs for quit smoking intervention education and evaluating its effectiveness are suggested for future studies. In addition, it is expected that this program will also be applicable to other medical professionals, including nurses, doctors, and pharmacists, who need quit smoking intervention education, and not only to nursing students.

Despite the importance of this study, there are certain constraints to consider. First, the participants of this study were nursing students from only two colleges, so there is a limitation on generalizing the research's results. Second, because participation was voluntary, meaning that participants were likely to be motivated to learn quitting smoking interventions, there could have been selection bias. Observing only the short-term effects on nursing students is another limitation. It is thus necessary to evaluate the sustainability of this program's effects through verification of the long-term effects of flipped learning.

Conclusion

In this study, a quit smoking intervention education program based on flipped learning was applied to nursing students, and its effectiveness was evaluated. As a result, it was found that nursing students' beliefs about the health benefits of quitting smoking and their attitudes toward and self-efficacy of quitting smoking interventions were improved. Students' satisfaction with the flipped learning method was also judged to be high. From these results, the flipped learning method can be considered an effective teaching method for quit smoking intervention education for nursing students compared to other conventional education methods, and this study can provide basic data when quit smoking intervention education is included in the regular nursing curriculum.

Conflict of interest

No potential conflict of interest relevant to this article was reported.

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Supplementary materials

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