ORIGINAL RESEARCH ORİJİNAL ARAŞTIRMA

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Comparison of the Effect of Using Kahoot in Nursing Fundamentals Education on Students' Achievement and Motivation Levels: A Randomized Controlled Study

Hemşirelik Esasları Eğitiminde Kahoot Kullanımının Öğrencilerin Başarısı ve Motivasyon Düzeyleri Üzerine Etkisinin Karşılaştırılması: Randomize Kontrollü Çalışma

Gözde ÖZARAS ÖZ[a]

[a]Department of Nursing, Çankırı Karatekin University Faculty of Health Sciences, Çankırı, Türkiye

ABSTRACT Objective: This randomized controlled study aims to investigate the effects of using Kahoot on the students' course success and motivation levels in fundamentals of nursing education. **Material and Methods:** This study was conducted with 67 first-year nursing students who registered in a university in Türkiye and agreed to participate in the research. The data were collected with introductory information form, midterm, final exam scores, and Instructional Materials Motivation Scale. **Results:** Kahoot group's midterm (u=218, p<0.05), final exam (u=364, p<0.05), and end-of-semester (u=229, p<0.05) scores were significantly higher than the control group. In the midterm exam, the Kahoot group's knowledge (u=265, p<0.05), comprehension (u=301.5, p<0.05), and total scores (u=201.5, p<0.05) of the cognitive domain were significantly higher than the control group. In the final exam, it was observed that the Kahoot group students had significantly higher knowledge (u=359.5, p<0.05) and total scores (u=360.5, p<0.05) in the cognitive domain than the control group. Given the mean motivation scores and the mean scores of all sub-dimensions in the case and control groups, it was concluded that the motivation level of both groups was moderate, and there was no significant difference between the two groups. **Conclusion:** It was concluded that the use of Kahoot increased the students' exam scores and learning outcomes at the basic level of the cognitive domain but did not affect their motivation levels.

Keywords: Nursing education; Kahoot; motivation; learning

ÖZET Amaç: Bu randomize kontrollü çalışma, hemşirelik esasları eğitiminde Kahoot kullanımının öğrencilerin ders başarıları ve motivasyon düzeyleri üzerindeki etkilerini incelemeyi amaçlamaktadır. **Gereç ve Yöntemler:** Bu çalışma, Türkiye'de bir devlet üniversitesinde öğrenim gören ve araştırmaya katılmayı kabul eden 67 hemşirelik 1. sınıf öğrencisi ile yürütülmüştür. Araştırma verileri, tanıtıcı bilgi formu, ara sınav, final sınavı puanları ve Öğretim Materyalleri Motivasyon Ölçeği kullanılarak toplanmıştır. **Bulgular:** Kahoot grubunun ara sınav (u=218, p<0,05), final sınavı (u=364, p<0,05) ve yarıyıl sonu (u=229, p<0,05) puanları kontrol grubuna göre anlamlı derecede yüksektir. Ara sınavda Kahoot grubunun bilişsel alana ilişkin bilgi (u=265, p<0,05), anlama (u=301,5, p<0,05) ve toplam puanları (u=201,5, p<0,05) kontrol grubuna göre anlamlı düzeyde yüksektir. Final sınavında Kahoot grubu öğrencilerinin bilişsel alanda kontrol grubuna göre anlamlı düzeyde daha yüksek bilgiye (u=359,5, p<0,05) ve toplam puanlara (u=360,5, p<0,05) sahip oldukları görülmüştür. Vaka ve kontrol gruplarında motivasyon puan ortalamaları ile tüm alt boyut puan ortalamalarına bakıldığında her iki grubun da motivasyon düzeylerinin orta düzeyde olduğu ve 2 grup arasında anlamlı bir fark olmadığı sonucuna varılmıştır. **Sonuç:** Kahoot kullanımının öğrencilerin bilişsel alan temel düzeyinde sınav puanlarını ve öğrenme çıktılarını artırdığı ancak motivasyon düzeylerini etkilemediği sonucuna varılmıştır.

Anahtar Kelimeler: Hemşirelik eğitimi; Kahoot; motivasyon; öğrenme

The nursing education program is a structured curriculum containing theoretical, and clinical components.[1] The nursing education process should provide the student with the knowledge, skills, attitudes, and values necessary to become a nurse.[2] Motivation increases students' success and directs them to work hard and learn at school. Thus, it increases the academic success of the students and improves the learn-

Correspondence: Gözde ÖZARAS ÖZ
Department of Nursing, Çankırı Karatekin University Faculty of Health Sciences, Çankırı, Türkiye
E-mail: gozdeozaras@karatekin.edu.tr

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ing outcomes.[3] Motivation is essential for success and affects students' learning in the fundamentals of nursing course. Nursing students face factors that negatively affect their academic performance and motivation levels starting from the beginning of their educational experience.[1] These factors are large and crowded classes in which traditional education is carried out, the number of students per instructor varies between 100 and 500, the fact that class size is inversely proportional to the student performance.[3-5] Therefore, in today's nursing education, skill-based techniques and advanced learning technologies have been recommended instead of process-based learning.[6] For this reason, students' constructivist learning approaches should be supported by integrating new methods that enable students to learn into the nursing education curriculum. There are many teaching methods such as group work, brainstorming, educational games used in nursing education.[7] Game-based learning is one of the teaching methods used in nursing education to improve learning outcomes, make learning enjoyable, make applications that seem boring and challenging, and provide motivation. Game-based learning teaches while having fun, making learning engaging and active for students.[7,8] Recently, game-based learning is an increasingly common phenomenon in education as it creates more positive effects than traditional teaching methods. Game-based learning increases the motivation of students by providing an immersive and fun learning process.[8] Participants can join the session and answer questions using their mobile phones, tablets, or computers.[9] The answers of all students can be viewed at the end of the session.[10] Kahoot lets them learn the lesson, increases competition, motivation, concentration, and learning, encourages students to maximize their learning in the classroom, reduces boredom, and has a positive impact on the student's learning outcomes, course success, and academic performance.[4,9,11-13] The Kahoot reaches the lowest level of Bloom's taxonomy, "knowledge or recall". The nature of Kahoot allows students to quickly recall facts, definitions, or memorized information.[14]

Shapiro et al. reported that factual and conceptual clickers questions increased the performance of the students on the factual exam questions, increased their knowledge, learning strategies, motivation, and learning outcomes.[15] In a study by Coveney et al., the students at universities in Ireland and Italy evaluated their experience and knowledge of Kahoot before applying skills labs, and most of the participants stated that Kahoot contributed to their positive learning experience.[13] When the national nursing literature is reviewed, there are very few studies investigating the effects of Kahoot use on achievement, learning outcomes or motivation: Aras and Çiftçi examined the effects of emphasis by questions-answers or Kahoot and concluded that none of the methods was superior.[7] Öz and Ordu examined the effects of web-based education and the use of Kahoot with nursing students.[5] They reported that the Kahoot method is a promising, effective, and useful formative assessment tool in terms of motivating and supporting learning activities. The findings show that game-based learning tools can be used effectively to provide learning and may support learning processes. With the characteristics of the new generation and the innovations brought by the age, it is inevitable to use new educational, instructive, and entertaining methods in nursing education. Considering the problems experienced by nursing students with a traditional education level, using Kahoot will be a remarkable result in the literature.

Within the scope of the nursing fundamentals course; It is important to enrich the course content with supportive learning environments in order for students to repeat the basic concepts of the course and to have a good command of the field terminology. Supportive learning environments create a psychologically safe environment where the learner is free to make mistakes without risking embarrassment or judgment. Where new learning strategies provided by nurse educators can bring competitive aspects, it can contribute to creating a safe space for students.[13] The gamification process with Kahoot encourages thinking skills in time-sensitive situations, thus ensuring better retention of information and development of intrinsic motivation.[7,13] Therefore, the fundamentals of nursing course should be conducted using different interactive methods in order to make the learning productive and to ensure the active participation of the students. It is thought that the conduct of this study

will contribute to nursing education and nursing literature. This study aimed to investigate the effects of using Kahoot on the students' course success (learning outcomes and exam scores) and motivation levels in fundamentals of nursing education. The hypotheses of the study are:

H1: Kahoot is more effective in developing students' achievement.

H2: Kahoot is more effective in developing students' motivation levels.

MATERIAL AND METHODS

STUDY DESIGN

A randomized controlled design was used and the intervention group (Kahoot game) and the control group (traditional in-class education) were compared. In this study, a single-blind experimental setup was used, and the participants did not know which group they belonged to.

STUDY SAMPLE

The research universe consisted of 121 first-grade undergraduate nursing students enrolled in the "fundamentals of nursing-I" course in the fall semester of the 2021-2022 academic year of a university. Hundred and ten students who met the inclusion criteria and agreed to participate in the study were included in the study. A power analysis was performed to identify the sample size.

In this study with two groups as experimental and control, the study was planned with a total of 56 samples, 28 samples in each group, with 90% power and 0.8 effect size. Therefore, taking possible dropouts into account, the sample of the study consisted of 67 students (Figure 1). Inclusion criteria for the study were speaking and understanding Turkish, taking the "nursing fundamentals-I" course for the first time, and not having experienced the Kahoot application before. Students who took the course again and had previous Kahoot experience were excluded.

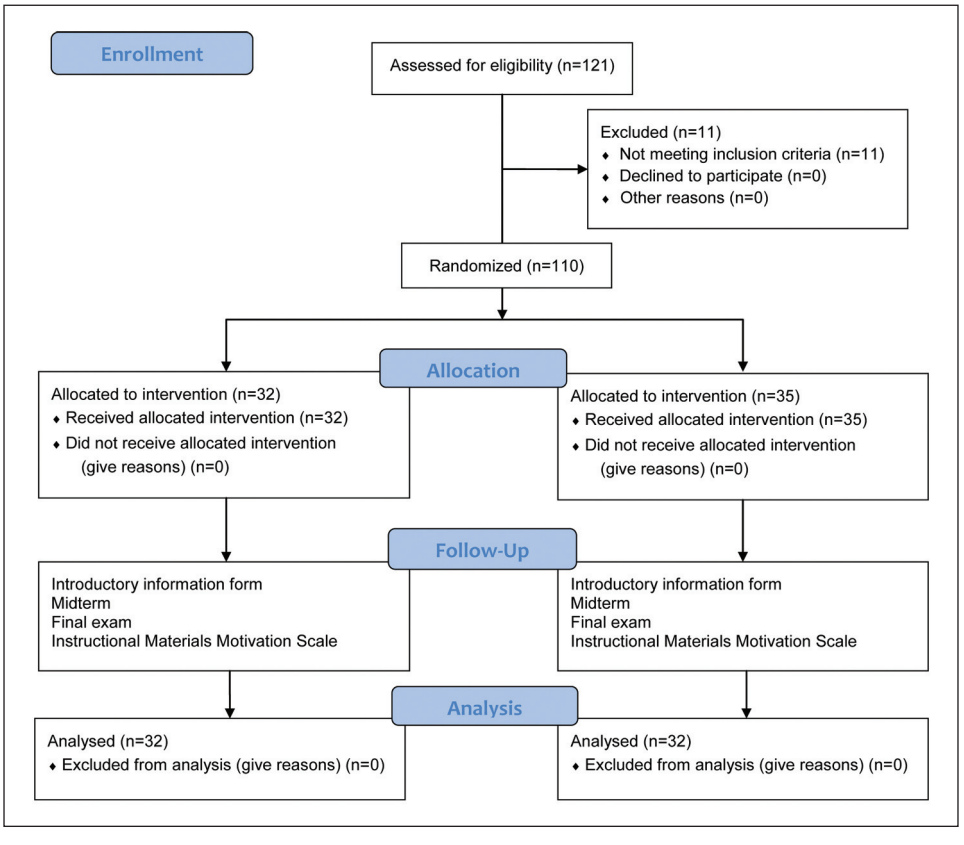

FIGURE 1: Study enrollment.

Therefore, considering possible dropouts, the sample of the present study consisted of 67 students, with the intervention (32) and control (35) groups (Figure 1).

DATA COLLECTION TOOLS

The data consisted of the "introductory information form" prepared by the researcher, "exams (midterm and final exam)" and "Instructional Materials Motivation Scale (IMMS)". Data collection tools were developed after the teaching contents of the "fundamentals of nursing-I" course was prepared. After the course content was prepared, a question pool was prepared by the researcher. The question pool was examined by 3 experts, who are fundamentals of nursing educators, and suitable questions were selected in line with the scope of the course.

INTRODUCTORY INFORMATION FORM

It consists of seven closed-ended introductory questions about gender, the type of graduated school, whether the nursing profession has been chosen voluntarily, the platform where they gather information the most, enjoying playing mobile games, daily mobile game playing time, and enjoying playing games for nursing education.

EXAMS

Cognitive learning objectives were assessed with a midterm and a final exam. First, a specification table was created, and then the questions were prepared by in light of the literature.[16] Learning objectives, 13 general objectives, and 41 cognitive sub-objectives were formed for the "fundamentals of nursing-I" course after reaching a consensus of experts from a cognitive perspective.

The mid-term and final exams consisted of 25 multiple-choice questions in total, and both exams contained 13 "knowledge" and 12 "comprehension" steps of the Bloom taxonomy cognitive domain. The compatibility of the "midterm and final" items with cognitive achievements was tested/evaluated by three expert faculty members from the fundamentals of nursing field and three from the department of measurement and evaluation in education. The content validity index was calculated using the "Davis" technique in terms of the compatibility of the "midterm and final" items of the "nursing fundamentals-I" course with the cognitive goals.

IMMS

"IMMS" is a measurement scale that allows for measuring the motivation related to the teaching material. The scale, consisting of 33 items, developed by Keller with reference to the ARCS model, was selected for this purpose and adapted into Turkish.[17] It is a 33-items, four-dimensional measurement scale adapted to Turkish by Dinçer and Doğanay.[18] There are 36 items in the original scale studied on university students. The highest score that can be obtained from the full scale is 165 and the lowest score is 33. An increase in the scale score is interpreted as an improvement in motivation for the teaching material. The total lower-upper score values taken from the scale are stated as very low (33.00-37.00), low (37.01-54.00), medium (54.01-143.00), high (143.01-160.99), and very high (161.00-165).[18] Cronbach alpha value for the whole scale is 0.96. In this study, the IMMS Cronbach alpha value was 0.94.

EVALUATION OF DATA COLLECTION TOOLS

The scores obtained by each student from each question were calculated and mean scores were determined for the midterm and final exams to evaluate each step of the cognitive domain of Bloom's taxonomy. Midterm and final exam results were evaluated by over "100" points. In addition, the student's overall success grade was calculated by taking 40% of the midterm exam score and 60% of the final exam score into account.

PROCEDURE

Random selection was made using https://www.random.org. A true random number was selected from among 110 students in a state university department of nursing. The selection was continued until sufficient sampling was reached.

DATA COLLECTION

Applications in the Experiment Group

The students experienced the fundamentals of nursing-I course with a PowerPoint (Microsoft, USA,

2013 version) presentation and face-to-face education supported by active learning methods, such as videos, question-answer-discussion, learning exercises, and word puzzles (Table 1). The students in the experiment group were informed about the Kahoot game strategy. During weeks 1-7 and 9-15, after the end of each lesson, the students played the "Kahoot" game in the classroom for about 10 minutes with a total of 10 questions. The first five minutes were the time to answer the questions, and the other five minutes were the evaluation of the results. The students' answers and their score calculations were automatically recorded in the system. The students were allowed to see the correct and incorrect answers on a slide, their learning deficits were detected, and a brief explanation was given to them. However, the educator did not see the results of the students. After the final exam, the introductory information form and IMMS were applied to the students.

Applications in the Control Group

The students experienced the fundamentals of nursing-I course with a PowerPoint presentation and face-to-face education supported by active learning methods, such as YouTube videos, question-answer-discussion, learning exercises, and word puzzles. The Kahoot game strategy was not applied to the students in the control group (Table 1). At the end of the final exam, the introductory information form and IMMS were applied to the students.

DATA ANALYSIS

The scores obtained from the midterm and final exams were transferred to an Excel (Microsoft Windows 11.0, USA) file and analyzed using descriptive statistics. Mean midterm and final exam scores were calculated for every student. The data obtained in this study were analyzed with the SPSS 22 (IBM SPSS Statistics 22.0, Chicago, IL, USA) package program. Since the data were not distributed normally, the Mann-Whitney U test was used for comparison between paired groups. The t-test was used to compare between groups due to the normal distribution of data. The relationship between categorical data was examined with the chi-square test. For the evaluation of the midterm and final exams, the score of each student from each question was calculated on the computer, and the mean scores were determined.

ETHICAL CONSIDERATION

The written ethical approvals of the study were obtained from Çankırı Karatekin University Ethics Committee (date: December 28, 2021; no: 468a532bc4634028). The purpose and method of the research was explained to the students in writing and orally in order to ensure that the students participate in the research voluntarily without feeling any pressure. Written informed consent was obtained from those who agreed to participate in the study. All processes of the research were carried out in accordance with the principles of the Declaration of Helsinki.

RESULTS

In our study, the findings showed that 68.8% of the case group and 77.1% of the control group were female, 90.6% of the case group and 82.9% of the control group were graduated from an Anatolian high school, 71.9% of the case group and 65.7% of the control group have chosen nursing profession voluntarily, 43.8% of the case group and 48.6% of the control group received information from the educators the most, 56.3% of the case group and 48.6% of the control group liked playing mobile games, 37.5% of the case group and 40% of the control group did not play any games every day, and 93.8% of the case group and 91.4% of the control group enjoyed playing games for nursing education. When the distribution of the participants' descriptive characteristics was compared, the two groups were similar, but no statistically significant differences were found (Table 2).

When the Kahoot group's midterm ($u=218$, $p<0.05$) final exam ($u=364$, $p<0.05$), and end-of-semester ($u=229$, $p<0.05$) scores were compared with the control group, it was determined that they obtained statistically significantly higher scores. The effect sizes of the difference between the case and control groups were 0.5, 0.3, and 0.5, respectively, indicating a big effect. The results showed that the

TABLE 1: A lesson plan for comparing the Kahoot and control groups.

Weeks	Unit topics	Learning outcomes*	Learning outcomes cognitive objectives	Teaching method (Kahoot group)	Teaching method (Control group)	Evaluation
1	Nursing as a profession	Count 2 differences between job and profession	Comprehension	PPP	PPP	Midterm
		Say the 3 features of the concept of profession	Knowledge	Q&A session	Q&A session	Final exam
		Know the concept of autonomy	Knowledge	Learning exercise	Learning exercise	
2	Nursing profession and historical development	Define the nursing profession	Knowledge	PPP	PPP	Midterm
		Count at least 4 of the professional criteria	Comprehension	YouTube video	YouTube video	Final exam
		Know the nursing practices in the ancient period	Knowledge			
		Discuss the historical development of the nursing profession	Knowledge			
3-4	Basic concepts of nursing	Explain physiological, psychological, socio-cultural aspects of human	Comprehension	PPP	PPP	Midterm
		Define the homeostasis approach	Knowledge	Word puzzles	Word puzzles	Final exam
		Distinguish between the objective and subjective health	Comprehension	Diagramming	Diagramming	
		Establish the relationship between environment and health	Comprehension			
5	Professional theories and theorists	Define the concept	Knowledge	PPP	PPP	Midterm
		Explain the importance of the concept	Comprehension	Group discussion	Group discussion	Final exam
		Explain the basic structure of nurse theorists and their theories.	Comprehension	Biography reading and writing repor	Biography reading and writing repor	
		List the differences between nursing theories	Knowledge			
6	Nurse's roles and responsibilities	Distinguish the traditional and contemporary roles of the nurse	Comprehension	PPP	PPP	Midterm
		Count at least 2 of the independent roles of the nurse	Comprehension	Card matching	Card matching	Final exam
		Count at least 3 of the nurse's responsibilities	Comprehension			
7	Nursing philosophy	Say or write the definition of philosophy concept	Knowledge	PPP	PPP	Midterm
		Distinguish the characteristics of philosophy and science	Comprehension	Group working Learning exercise	Group working Learning exercise	Final exam
		Count at least 3 of the concepts of nursing philosophy	Comprehension			
8	Midterm					
9	Professional values in nursing	Define the professionalism	Knowledge	PP	PP	Midterm
		Count at least two of the professional values	Comprehension	Q&A session	Q&A session	Final exam
		Know the conditions of being a professional profession	Knowledge			
10	Legal aspect of nursing	Distinguish between civil servants and labor law clauses	Comprehension	PPP	PPP	Final exam
		List at least 3 items related to nursing law	Knowledge	Group working Learning exercise	Group working Learning exercise	
11	Patient and employee safety	Define the concept of patient safety	Knowledge	PPP	PPP	Final exam
		Count at least 5 risks for high-risk drugs	Comprehension	Q&A session	Q&A session	
		Explain the practices to prevent health-related infections	Comprehension	Learning exercise	Learning exercise	

TABLE 1: A lesson plan for comparing the Kahoot and control groups *(continued)*.

Weeks	Unit topics	Learning outcomes*	Learning outcomes cognitive objectives	Teaching method (Kahoot group)	Teaching method (Control group)	Evaluation
12	Patient rights and ethics	List at least 3 behaviors that comply with ethical principles	Knowledge	PPP	PPP	Final exam
		Count the stages of ethical decision making process	Comprehension	YouTube video	YouTube video	
		Explain the relationship between ethical sensitivity and ethical decision making process	Comprehension	Reading article and discuss	Reading article and discuss	
13	Patient admission and discharge	Count at least 2 types of patient admission	Comprehension	PPP	PPP	Final exam
		Tell 5 of the nurse's responsibilities in patient admission	Knowledge	Q&A session	Q&A session	
		Count the types of discharge of the patient	Comprehension			
14	Sleep	Identify the stages of sleep	Comprehension	PPP	PPP	Final exam
		Explain the sleep requirements according to the developmental periods	Comprehension	Word puzzles	Word puzzles	
		Explain the sleep disorders	Comprehension	Diagramming	Diagramming	
15	Death	Count the death indicators	Comprehension	PPP	PPP	Final exam
		Explain the roles and responsibilities of the nurse in palliative care	Comprehension	YouTube video	YouTube video	
		Explain the physical, psycho-social needs of the patient nearing death	Comprehension			
16	Final exam					

*Not all learning outcomes were written in this table, because the table would be too long; PPP: Power Point presentation; Q&A: Question-answer.

students who applied Kahoot had significantly higher course success than the control group. Thus, the H1 hypothesis was confirmed (Table 3).

In the midterm exam, the students in the Kahoot group were significantly more successful than the control group regarding cognitive domain knowledge ($u=265$, $p<0.05$), comprehension ($u=301.5$, $p<0.05$), and total scores ($u=201.5$, $p<0.05$). The effect sizes of the difference between the case and control groups in these evaluations were 0.4, 0.4, and 0.5, respectively, indicating a big effect. In the final exam, it was observed that the students in the Kahoot group had significantly higher scores regarding cognitive domain knowledge ($u=359.5$, $p<0.05$) and total scores ($u=360.5$, $p<0.05$) than the control group. The effect size of the difference between the groups in this assessment was 0.3, indicating a big effect. Our study results showed that the learning outcomes of the students who had Kahoot were significantly higher than the control group; therefore, hypothesis H1 was confirmed (Table 4).

When the mean scores of Kahoot sub-dimensions were examined in the Kahoot group, the findings showed that the mean scores were 39.0±6.0 for the "attention" sub-dimension, 33.0±4.0 for the "relevance" sub-dimension, 34.91±4.71 for "confidence" sub-dimension, and 24.0±4.0 for "satisfaction" sub-dimension. The mean scores of Kahoot sub-dimensions were 37.0±6.0 for the "attention" sub-dimension, 32.0±5.0 for the "relevance" sub-dimension, 33.43±5.01 for "confidence" sub-dimension and 23.0±3.0 for "satisfaction" sub-dimension in the control group. The mean IMMS total score was 132.0±17.0 in the Kahoot group and 126.0±17.0 in the control group, and the motivation level of both groups was moderate. No statistically significant differences were found between the "Kahoot" and "control" groups for the mean total IMMS scores and all sub-dimension scores. Therefore, the H^2 hypothesis was rejected ($p>0.05$) (Table 5).

TABLE 2: Introductory characteristics of students in the case and control groups.

		Groups					
		Case (n=32)		Control (n=35)		Test and significance value	
Characteristics		**n**	**%**	**n**	**%**	**χ^2**	**p value**
Gender	Female	22	68.8	27	77.1	0.248	0.618
	Male	10	31.3	8	22.9		
Graduation	Normal high school	2	6.3	3	8.6	*	0.752
	Anatolian high school	29	90.6	29	82.9		
	Health high school	1	3.1	3	8.6		
State of choosing the profession of nursing willingly	Yes	23	71.9	23	65.7	0.078	0.783
	No	9	28.1	12	34.3		
Where information provides the most	Books	4	12.5	6	17.1	*	0.865
	Educators	14	43.8	17	48.6		
	Friends/family	3	9.4	2	5.7		
	Internet and media	11	34.4	10	28.6		
Like to play mobile games	Yes	18	56.3	17	48.6	0.147	0.701
	No	14	43.8	18	51.4		
How many minutes of mobile games a day	0	12	37.5	14	40.0	*	0.135
	1-60	10	31.3	14	40.0		
	61-120	8	25.0	2	5.7		
	121 and above	2	6.3	5	14.3		
Like to learning by playing for nursing education	Yes	30	93.8	32	91.4	*	1
	No	2	6.3	3	8.6		

*As a result of the analysis, Monte Carlo Simulation is used. This test result only gives the p value. *Means no value.

TABLE 3: Exam success status of students in the case and control group.

			Mean scores	Statistical evaluation		
Exam types	**Groups**	**n**	**$\bar{X}$±SD**	**U***	**p value**	**Cohen's d**
Midterm exam	Case	32	83.0±6.0	218	0.0001	-0.5
	Control	35	74.0±9.0			
Final exam	Case	32	87.0±7.0	364	0.013	-0.3
	Control	35	80.0±13.0			
Overall grade**	Case	32	86.0±5.0	229	0.0001	-0.5
	Control	35	77.0±10.0			

*Mann-Whitney U test was used; **Overall grade was the sum of 40% of the midterm exam and 60% of the final exam; SD: Standard deviation.

TABLE 4: The mean scores of the students in the case and control group regarding the exam scores and cognitive field levels (n=67).

		Midterm exam				Final exam			
Levels of the		**Mean scores**	**Statistical evaluation**			**Mean scores**	**Statistical evaluation**		
method domain	**Groups**	**$\bar{X}$±SD**	**U***	**p value**	**Cohen's d**	**$\bar{X}$±SD**	**U***	**p value**	**Cohen's d**
Knowledge	Case	41.0±5.0	265	0.0001	-0.46	47.0±3.0	359.5	0.008	-0.32
	Control	35.0±7.0				43.0±8.0			
Comprehension	Case	43.0±4.0	301.5	0.001	-0.41	41.0±5.0	408.5	0.052	-0.23
	Control	39.0±5.0				37.0±8.0			
Overall**	Case	83.0±6.0	201.5	0.0001	-0.55	88.0±7.0	360.5	0.011	-0.3
	Control	78.0±9.0				80.0±14.0			

*Mann-Whitney U test was used; **Overall grade was the sum of 40% of the midterm exam and 60% of the final exam; SD: Standard deviation.

TABLE 5: Comparison of case and control group's IMMS and its subdimensions mean scores and total score averages (n=67).

	Case group	Control group	Statistical evaluation	
	$\bar{X}$±SD	$\bar{X}$±SD	t*	p value
Attention	39.0±6.0	37.0±6.0	1.389	0.172
Relevance	33.0±4.0	32.0±5.0	1.182	0.242
Confidence	34.91±4.71	33.43±5.01	1.242	0.219
Satisfaction	24.0±4.0	23.0±3.0	1.44	0.155
IMMS	132.0±17.0	126.0±17.0	1.458	0.154

*t-test was used; IMMS: Instructional Materials Motivation Scale; SD: Standard deviation.

DISCUSSION

Kahoot game ensures that the taught information is permanent, entertains while teaching, increases the motivation of the students and supports student success as it supports the subject at the end of the lesson.[19,20] In the current study, the findings showed that the Kahoot application increased the students' test scores and learning outcomes at the basic level of the cognitive domain. Thus, the H1 hypothesis has been confirmed and we may say that Kahoot group students will be more successful than control group students. The results of the present study support the literature data and our related hypothesis. Corell et al. and Coveney et al. reported that Kahoot provides a competitive learning environment and supports the academic success of students.[13,21] Sheng et al., in a descriptive study evaluating the use and perceptions of the student response system in undergraduate nursing students, stated that the gamification technique increases learning, formative assessment, and participation and clarifies difficult parts.[9] Shapiro et al. reported that factual and conceptual clickers questions increased students' exam performance, knowledge, learning strategies, motivation, and learning outcomes.[15] In Toothaker's study entitled "Generation Y's perspective on clickers technology in nursing education," 91% of the students reported that the use of clickers caused a better understanding of the lesson.[12] On the other hand, Ismail et al. used Kahoot as a formative assessment tool and conducted group interviews.[22] The results showed that Kahoot helped the students' study, identify research topics, and be aware of what they learned, and it turned out to be a promising tool for medical education regarding formative assessment. Yılmaz examined mobile phones as an alternative to the use of clickers and concluded that the system was developed to increase the success of students.[23] Contrary to our findings, Aras and Çiftçi examined the mean scores of the "Question-Answer" and "Kahoot" student groups and determined that there was no significance between the groups.[7] In general, the findings of the study indicate that Kahoot increases course success, learning outcomes, and academic results, supports the subject, increases learning and memorability, clarifies the hard-to-understand parts, and consequently increases the motivation of the students.

In the current study, the findings suggest that thanks to the "instant feedback" feature of the Kahoot application, which is applied after each subject, students have identified the subjects they have learning difficulties and eliminated their knowledge deficiencies. By supporting the subjects, they achieved success in the exam. Thus, Kahoot is a crucial tool for identifying where students need support before the exam.

Another factor affecting students' success is Kahoot's "anonymity" function. Students' fear of giving wrong answers, being embarrassed while expressing their thoughts, and being criticized negatively affect their participation in the lesson.[4] The anonymity function allows students to play shamelessly freely answer questions and participate in the lesson.[5] This situation may help students prepare for their exams and encourages them to maximize their learning in the classroom.

Given the mean total IMMS scores and the mean scores of all sub-dimensions in the case and control

groups, it was concluded that the motivation level of both groups was moderate, and there was no significant difference between the two groups. The H^2 hypothesis was rejected ($p>0.05$). The lack of significant difference in the motivation levels of the students in our study may be due to the scoring and ranking concerns of the Kahoot group students and the students who do not see their names on the leaderboard. Yapıcı and Karakoyun stated that seeing low scores in Kahoot results upsets students' morale.[20] Another factor is that approximately 40% of the students in the case group did not like to play mobile games and not playing any games during the day. Thus, it may not have piqued the student's interest in Kahoot and did not influence their motivation to increase. The results of this study are consistent with the literature data. Consistent with our findings, Castro et al., Gallegos et al. and Aras and Çiftçi found that in researching online games, the scores they get from the games and the score ranking are not motivating factors for nursing students.[7,19,24] The same active learning methods (e.g., question-answer, learning exercises, YouTube, video, and word puzzle) were used in the case and control groups, and active participation of the students in the lesson was ensured in both groups (Table 1). This might affect the motivation of the students at the same level. Therefore, it may be said that the Kahoot application does not change.

In this study, Kahoot was used in fundamentals of nursing education. The findings obtained in the current study showed that students' success increased when the educational processes of the students were supported by the Kahoot application. The use of Kahoot increased the students' test scores and learning outcomes at the basic level of the cognitive domain; however, it did not affect their motivation levels.

LIMITATIONS

In this study, the absence of a commission for the evaluation of questions can be expressed as limitation. At the same time, these study's results are limited to first-grade nursing students at a university in Türkiye.

CONCLUSION

In this study, in which the effects of the use of Kahoot on the success and motivation levels of the students were compared in fundamentals of nursing education. The findings showed that the Kahoot application was promising in increasing the success levels of the students; however, it was concluded that it did not affect motivation levels. Therefore, it is thought that this study will not contribute to the increase of scientific knowledge. This study draws attention that the Kahoot application should be used in the undergraduate curriculum to increase academic success. In addition, further research is recommended on larger groups, different age groups, different study populations, and in other departments and courses.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

This study is entirely author's own work and no other author contribution.

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