ÖZGÜN ARAŞTIRMA ORIGINAL RESEARCH

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THE EFFECT OF PICO GAME ON NURSING DIAGNOSIS AND PROBLEM-SOLVING SKILLS OF STUDENTS

PİCO OYUNUNUN ÖĞRENCİLERİN HEMŞİRELİK TANILARI VE PROBLEM ÇÖZME BECERİLERİ ÜZERİNE ETKİSİ

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Öz

Amaç
Bu araştırma, PICO oyununun öğrencilerin hemşirelik sürecinde tanı ve planlamayı belirleme ve problem çözme becerilerine olan etkisinin belirlenmesi amacıyla gerçekleştirilmiştir.

Gereç ve Yöntem
Araştırma Şubat-Mart 2020 tarihinde yapılan yarı-deneysel tipte bir araştırmadır. Araştırmanın örneklemini hemşirelik bölümünde hemşirelik süreci dersine devam eden 40 ikinci sınıf öğrencisi oluşturmuştur. Araştırmanın verileri sosyodemografik özellikler anketi, memnuniyeti değerlendirmeye yönelik görsel analog ölçeği, problem çözme envanteri ve hemşirelik süreç planlama tablosu ile toplanmıştır.

Bulgular
Öğrencilerin PICO oyunu öncesi ve sonrası Problem Çözme Becerileri Ölçeği toplam ve alt ölçekleri puan ortalamaları arasında anlamlı bir fark bulunmamıştır. Öğrencilerin dersin işlenişi ile ilgili memnuniyet puan ortalaması 10 üzerinden 9.38±1.19 olarak belirlenmiştir.

Sonuç
Araştırma sonucunda, öğrencilerin PICO senaryolarına özgü etkili klinik soru sorma ve hemşirelik tanılarını ve bu tanılara özgü girişim ve hasta sonuçlarını doğru bir şekilde belirledikleri saptanmıştır.

Anahtar Kelimeler: PICO, Oyuna Dayalı Öğrenme, Hemşirelik, Hemşirelik Süreci, Problem Çözme Becerisi

Abstract

Objective
This research was conducted to determine the effect of the PICO game on students' problem-solving skills as well as their ability to determine the diagnosis and planning in the nursing process.

Materials and Methods
The research is a quasi-experimental study conducted in February-March 2020. The sample of the research was comprised of 40 second year students attending the nursing process course at the department of nursing. The data of the research were collected with a questionnaire for socio-demographic characteristics, visual analog scale for assessing satisfaction, the

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problem-solving inventory and the nursing process planning table.

Results
There was no significant difference between the total and subscale scores of the Problem-Solving Inventory before and after the PICO game. The average satisfaction score of the students about the conduction of the course was found to be 9.38 ± 1.19 out of 10.

Conclusion
As a result of the research, the students were able to correctly identify the effective clinical questions and nursing diagnoses specific to PICO scenarios and the interventions and patient outcomes specific to these diagnoses.

Keywords: PICO, Game Based Learning, Nursing, Nursing Process, Problem Solving Skills

Introduction

Providing care forms the basis of nursing practices. Effective care delivery is made possible via the nursing process (NP), which is a systematic and planned process that integrates the problem solving approach into nursing care (1). Since it guides nurses in making planned and purposeful decisions, the use of NP in patient care allows the provision of a patient-centered, holistic and individualized care (1,2). The foundation of the knowledge and skills required for the use of the NP by nurses is laid in nursing education (3). The objectives of the undergraduate programs that provide nursing education include the training of graduates who would provide nursing care with a systematic approach.

The nursing process consists of steps such as identifying the problems of healthy/sick individuals, planning, implementing and evaluating the necessary nursing interventions. The diagnosis step helps the systematic collection of data on the patient's health problems. After diagnosis, the health problem of the patient is determined by using the collected data and the nursing diagnosis is formulated. The planning of nursing interventions specific to the problems and predicted patient outcomes constitutes another step (1,4). It is of importance that the nursing process is a tool that teaches students the steps of scientific problem solving, and it is essential that evidence-based practices are used while planning the care in accordance with national practice standards. The first step in the evidence-based nursing process is to develop clinical questions. Clinical questions are the questions that determine the best way to solve the nursing problems (diagnoses) identified during the diagnostic phase. The process of developing clinical questions actually constitutes the nursing diagnosis and planning steps of the NP (5). The reason for this is that clinical questions are crucial for students to be able to plan a purposeful intervention for the established nursing diagnoses.

Well-designed clinical questions increase the likelihood of practitioners establishing accurate diagnoses and finding the correct answers (6) Asking the question is the most challenging step in the evidence-based nursing process (7). In this research, the PICO method was used to develop effective clinical questions and the method was based on a game (8,9). Learning through games, which is commonly used in health education (10), is active and student-centered (11). Game-based teaching is a method that is conducted in a competitive environment with predetermined rules by the educator (12). Games are a teaching strategy used by educators to engage students in learning (10), increase self-confidence, develop group collaboration and enable interaction (13). The use of games in education draws the attention of students by making the learning environment interesting (11). In this way, the students are motivated and their self-esteem is increased (10,14). Games are also an effective tool for developing critical thinking skills (8,15,16). Increasing the retention of knowledge previously learned enhances the knowledge (11). The method of learning with games in nursing education, which dates back to the 1980s, improves critical thinking and problem solving skills that are effective in the clinical decision-making process (11,12). PICO stands for Problem, Intervention, Comparison and Outcome. PICO is one of the best tools that help formulate questions and directly contribute to finding solutions to the problems of individuals (8). The clinical questions to be determined by the students will contribute to their ability to establish nursing diagnoses specific to cases diagnoses and plan their interventions as well as predicted patient outcomes. In this way, students will be able to better understand the diagnosis and planning steps of the NP and perform more qualified and evidence-based nursing care after graduation. Furthermore, the effect of the PICO game to be used in the teaching of the NP on problem-solving skill will be examined.

It was determined that the PICO game was used to develop the ability of nursing students to create

evidence-based, consistent and systematic questions about practice problems (8,9,17), and in another study, it was used to provide web-based evidence-based practice experiential learning (18). In our study, unlike these studies, the PICO game was used to determine the nursing diagnosis and nursing interventions and the effect on students' problem solving skills.

This research was conducted to determine the effect of the PICO game on students' problem-solving skills as well as their ability to determine the diagnosis and planning in the nursing process.

Materials and Methods

Study Design and Sample

In this quasi-experimental research, a one-group pretest posttest design was used. The research was conducted at a faculty of health sciences between February-March 2020. The sample of the study consisted of 40 second year students out of those taking the NP course (N: 55) in the 2019-2020 academic year, who agreed to participate in the research. In the institution where the research was conducted, the NP course was given for 2 hours a week in one semester. In calculating the sample size of the research, power analysis was carried out post hoc by using the G * Power 3.1 software. The statistical power of the study was calculated as 0.86 with an alpha error probability of 0.05 and a large effect size of 0.5.

Intervention in the Classroom

Np course was designed to be instructed by using case discussion, lecture, question and answer method. The contents of NP were consisted of the history of nursing process, critical thinking, problem solving steps and steps of the nursing process. After teaching the nursing process and problem-solving steps, the students'problem-solving skills and sociodemographic characteristics were determined and the researchers explained how to play the PICO

Table 1 Sample PICO Tables

Case	P	I	C	O
The patient in the intensive care unit cannot use upper extremities. Oral care of the patient is provided by relatives. The patient has oral injuries. The use of 5% NaHCO3 is planned for oral care.	Impaired oral mucous membrane	Oral Health Restoration (NIC) Oral care with 5% $NaHCO_3$	Application by patient's relatives	Oral Health (NOC) There will be an improvement in patient's oral cavity.
The patient, who was hospitalized in the orthopedic clinic due to hip fracture, has pain marked as 6 in the visual analogue scale. Other nurses responsible for the patient's care are trying to cause distraction by asking different questions to the patient. However, there seems to be no decrease in the patient's pain. You are planning to teach the patient relaxation techniques.	Acute pain	Conscious Sedation (NIC) Relaxation techniques	Distraction	Pain Level (NOC) The patient will mark the pain level between 0-3 on the visual analogue scale.
You have a patient expressing an inability to defecate for five days. It seems that the patient has had fast food recently and hasn't paid attention to fluid intake.	Constipation	Constipation/ Impaction Management (NIC) Fluid intake Juicy foods	Fast food consumption, low fluid intake	Bowel Elimination (NOC) The patient will express ability to defecate.
You measured the fasting blood glucose level of your DM patient at the internal medicine clinic as 250 mg / dl. When you talk to the patient, you find out that s/he does not know how to comply with the recommended dietary regulations.	Deficient Knowledge	Teaching: Individual (NIC) Information on nutrition in diabetes	Previous level of knowledge	Knowledge of: Diet (NOC) The patient will state that s/he pays attention to his/her diet.

game to the students and play one sample. After that, PICO game was played with students in the classroom. The object of the PICO game is to be the first group player to complete 10 PICO table correctly. All the of students were assessed by the researcher with educator experience who had previously learned and practiced PICO game. In the PICO game, 10 cases and case-specific PICO tables and answer keys cards were created for the students to plan their nursing process by the researchers. There are 10 cases tables with different nursing process issues focusing on comparing an intervention to usual or standard of nursing care. Ten tables have a case and P, I, C, O word to match a case. At The PICO Game (P) is for identify problem and nursing diagnosis, (I) is for nursing intervention, (C) is for comparing attempts with existing evidence (O) is for expected patient outcomes from clinical cases that focus on interventions or treatments. Table 1 displays a sampling of cases and matching P, I, C, O. Group players are expected to correctly fill in each PICO tables distributed as soon as possible. Group players yell “PICO” when they think they have a completed question, and the researchers check it against the PICO answer key card. If it is correct, new PICO table is placed in front of that group player and the game continues. The PICO game was implemented in the following steps.

Steps 1: All students were divided into eight groups of five. Each researcher was responsible for four groups and checking the PICO tables.

Steps 2: The first of the PICO table was distributed to each group simultaneously in a sealed envelope. The game started with the warning "You can open the closed envelopes". Researchers observed groups of students. No clues were given.

Step 3: In accordance with the given case, students were asked to determine their nursing diagnoses, and plan their diagnostic interventions and patient outcomes on the PICO tables. Researchers observed groups of students. No clues were given.

Step 4: The researcher went to the first group that yelled PICO and checked the PICO table with the PICO Table answer key card. If it was correct, other PICO tables gave it. If there was an error, they were given feedback by the researcher to read the case carefully again.

Step 5: At last, the first group that finished all the PICO tables correctly won the game. The winning group was only applauded.

Instruments

The data of the research were collected with a questionnaire on sociodemographic characteristics, the visual analogue scale (VAS), the problem-solving inventory and the NP diagnosis and planning table.

Visual Analogue Scale (VAS): Students were asked to indicate their satisfaction level regarding how the course was given by choosing a value between 0-10 on the scale. Students marked on a scale from 0 to 10 (0 cm = very dissatisfied, 10 cm = very satisfied). The distance of the line from the zero point to the point marked by the individual indicates the condition of the person and is recorded in inches.

Problem Solving Inventory (PSI): The Turkish version of PSI developed by Heppner and Petersen (1982) was conducted by Şahin et al. (1993) (19,20). The scale consists of 35 items scored on a six-point Likert scale. The responses to the items correspond to the following points; “1: I always act like this; 2: I usually act like this; 3: I often act like this; 4: I sometimes act like this; 5: I rarely act like this; 6: I never act like this”. The total score that can be obtained from the PSI ranges between 32-192, and a high score indicates that the individual perceives himself/herself as inadequate in terms of problem solving while a low score indicates that the individual perceives himself/herself as adequate. The scale consists of three subscales which are as follows; Problem-Solving Confidence (PSC) (5, 10, 11, 12, 19, 23, 24, 27, 33, 34, 35. items) expresses the individual’s self-assurance while engaging in problem-solving activities, Approach/Avoidance (AA) (1, 2, 4, 6, 7, 8, 13, 15, 16, 17, 18, 20, 21, 28, 30, 31. items) refers to individuals’ reviewing their initial efforts in problem solving and actively researching alternative solutions, and Personal Control (PC) (3, 14, 25, 26, 32. items) which indicates individuals’ ability to maintain control in problematic situations (20). The total cronbach alpha value of the scale was determined to be 0.88 while the cronbach alpha value of the PSC subscale was 0.76, the cronbach alpha value of AA subscale was 0.78 and the cronbach alpha value of PC subscale was 0.69 (20). In this study, the total cronbach alpha value of the scale was found to be 0.89 and 0.92, the cronbach alpha value of the PSC subscale was 0.76 and 0.83, the cronbach alpha value of the AA subscale was 0.86 and 0.89, and the cronbach alpha value of the PC subscale was 0.46 and 0.69 respectively.

Nursing Process Diagnosis and Planning Table (PICO tables): is a table where students could plan their nursing processes in line with the given cases

as P (problem), I (intervention), C (comparison), and O (outcome).

Data collection

The data collection process took place in the classroom where the NP course was given and lasted for one class hour. The data collection phase was carried out by the researchers in the research (Figure 1).

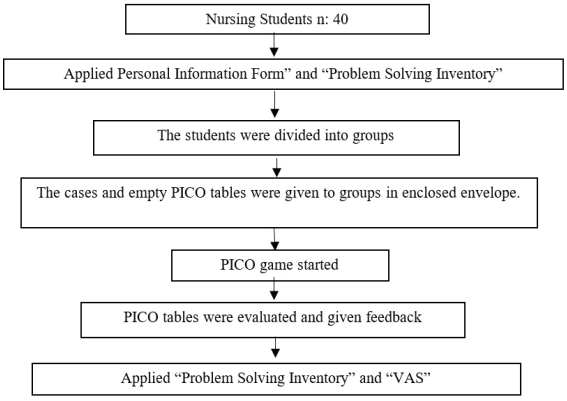

Figure 1
Flow of data collection

Stage 1: Nursing Process course was taught for 13 two hours with case discussion, lecture and question and answer method. The PICO game was played in the 8th week.

Stage 2: After teaching the nursing process and problem solving steps, the students who were voluntary were asked to fill out the "Personal Information Form" and "Problem Solving Inventory". The students were told how to play the PICO game and groups of 5 students were formed for the PICO game and PICO game was played.

Stage 3: One week after the PICO game, the students who were voluntary were asked to fill out "Problem Solving Inventory" and evaluate their satisfaction level regarding the course through "VAS".

Data Analysis

For the analysis of the study data, the statistical package for social sciences (SPSS) version 20.0 (SPSS Inc., Chicago, IL, USA) for Windows was used. In analyzing students' sociodemographic characteristics and satisfaction levels; number, percentage, arithmetic mean, and standard deviation were used. To evaluate the problem-solving skills of students before and after the PICO game, Paired Sample t test and Wilcoxon Signed Rank test were used.

Ethical Considerations

In order to conduct the research, written consent was obtained from the ethics committee of the institution (ethical committee number: 13/01 dated 26.12.2019) and the faculty where the research was conducted. The students who agreed to participate in the research were asked to fill in an informed consent form.

Results

A total of 40 students from the nursing department participated in the research. It was determined that the mean age of the students was 19.78 ± 0.76 and 75% (n = 30) were women. The mean VAS score used to measure students' satisfaction with the PICO game was determined as 9.38 ± 1.19.

The total mean scores and the mean subscale scores of the students obtained from the PSI are given in Table 2. It was found that the students PSI mean

Table 2 Comparison of the Students' Problem-Solving Inventory Total Scale and Subscale Mean Scores Before and After the PICO Game

PSI Total Scale and Subscale	Before PICO Game (n=40)	After PICO Game (n=40)	Statistical Analysis	
	M±SD	M±SD	t	p
PSC	25.13±6.84	24.50±7.79	.601	.552
PC	15.30±3.47	14.60±4.11	1.297	.202
AA	41.08±11.18	38.45±12.20	1.893	.066
Total Scale	95.25±18.55	90.68±20.47	1.912	.063

Note. M= mean; SD= standard deviation; t= paired sample t test, PSC=Problem-Solving Confidence, PC= Personal Control, AA= Approach/Avoidance,

Table 3 Comparison of the Male and Female Students' Problem-Solving Inventory Total Scale and Subscale Mean Scores Before and After the PICO Game

PSI Total Scale and Subscale	Female (n=30)			Male (n=10)		
	M±SD	MR	SR	M±SD	MR	SR
PSC	25.13±7.11	13.67	123.0	25.10±6.31	5.0	40.0
PSC*	23.60±8.02	14.17	255.0	27.20±6.68	7.50	15.0
	Z:-1,588 p= .112			Z:-1.283 p= .199		
PC	15.27±3.79	10.95	120.50	15.40±2.46	6.30	31.50
PC*	14.10±4.34	16.79	285.50	16.10±3.00	4.70	23.50
	Z:-1.885 p= .059			Z:-0.413 p= .679		
AA	40.23±12.10	13.44	121.00	43.60±7.81	5.83	17.50
AA*	37.03±13.01	15.70	314.00	42.70±8.54	4.58	27.50
	Z:-2.090 p= .037			Z:-0.595 p= .552		
Total Scale	94.43±19.70	12.11	109.00	97.70±15.23	5.25	21.00
Total Scale*	87.97±21.34	16.95	356.00	98.80±15.82	4.80	24.00
	Z:-2.541 p= .011			Z:-0.178 p= .859		

Note. M= mean; SD= standard deviation; MR= mean rank; SR= sum of ranks; Z= Wilcoxon signed rank test
* Post PICO game, PSC=Problem-Solving Confidence, AA= Approach/Avoidance, PC= Personal Control

score before the PICO game was 95.25, while it was found to be 90.68 after the game. Female students PSI mean score before the PICO game was 94.43, while it was found to be 87.97 after the game. Male students PSI mean score before the PICO game was 97.70, while it was found to be 98.80 after the game. There was no significant difference between the students' PSI total and subscale mean scores before and after the PICO game. In terms of gender, a significant difference was found between the total PSI mean scores of the female students before and after the PICO game (Z: -2.541 p: 0.011) as well as their scores from the Approach-Avoidance subscale (Z: -2.090 p: 0.037). As for the male students, no significant difference was found (Table 3).

Discussion

Since the basic principles of the nursing process are based on the scientific process of problem solving, it is necessary to make evidence-based decisions while forming the steps of the NP. In this research, PICO, one of the game-based learning strategies, was used to evaluate the evidence-based nursing process. The aim of the game is to be the first player/group of players to complete the PICO question correctly (9,21). In our study, 10 different clinical case were created by the researchers. Student groups were asked to determine their nursing diagnoses specific to clinical case and turn them into clinical questions. As a result of the research, it was seen that the average satisfaction level of students regarding the PICO game was high (9.38±1.19). In studies conducted with nursing students, it has been reported that students want the lessons to be supported by games (11,22). In a systematic review, it was stated that nursing students reported the benefits of games as providing an active learning environment, quick feedback; facilitating the understanding of complex situations, increasing experience, empathic skills, communication, interaction and motivation (23). In the research, PICO method was developed based on the game. Milner and Cosme (2017) reported that most students considered PICO to be an exciting and entertaining method (8).

In order to facilitate the evidence-based nursing process, student nurses are expected to have sufficient knowledge and skills for creating clinical questions (7). In our study, with the PICO game, each group of students was asked to determine the existing nursing diagnoses specific to the case, and the interventions and patient outcomes specific to these diagnoses. In this way, it was also possible

for the instructor to evaluate whether the students understand these stages correctly. The first group that won the PICO game completed the game in an average of 20 minutes. Except for only one group, the participating groups saw all the case and completed the PICO tables specific to these cases. One group did not have enough time to see the last two cases. Most of the student groups did not have any difficulty in identifying nursing diagnoses and interventions specific to the cases. However, there were groups that experienced difficulty in determining patient outcomes.

In this study, it was determined that the students perceived themselves at an intermediate level regarding problem solving skills. In other studies conducted on nursing students, the problem solving levels of the students were found to be similar to our study (24–28). Although there is no significant difference between the problem-solving skills of the students before and after the PICO game, a quantitative difference was found. Furthermore, the fact that female students perceived their problem-solving skills better after the PICO game is a result that indicates the contribution of PICO game to problem solving skills. The female students perceived themselves as more adequate in reviewing their problem-solving efforts and doing research for alternative solutions to solve a new problem. In another study, it was determined that female students perceived their perception of problem solving skills better (29) It can be said that gender has an effect on perception of problem solving skills.

One of the educational objectives that games will provide students with is the problem-solving element. The findings of a study demonstrate that it is essential to design a game-based learning environment to increase the motivation and participation of students and that this motivation is effective on problem solving results (30). The nursing process is a systematic method used for finding solutions to the problems of the healthy/sick individuals. The steps of the nursing process are similar to those of scientific problem solving. The problem-solving process enables one to notice problems. The basis of the problem-solving process in nursing is the diagnostic phase where the problems are noticed. In the diagnostic process, the problem is completely and accurately revealed. In this process, nurses reconsider the causes of the problems they notice. Furthermore, they also plan the interventions specific to the problem. In the research, the PICO game helped students identify case-specific patient problems, diagnostic-specific interventions, and patient outcomes, contributing to their problem-solving skills.

The limitations of the research are that the PICO game was played only once, the course is given with case discussions, lecture, question and answer method. The evaluation of students' problem-solving skills one week after PICO game is another limitation.

Conclusion

It was determined that students correctly identified the clinical questions, nursing diagnoses specific to the PICO cases as well as the interventions and patient outcomes specific to these diagnoses. It was found that students perceived themselves to be moderately adequate in problem solving skills. It was also determined that female students perceived their problem-solving skills more adequate after the PICO game. This finding shows that the PICO game contributes to students' problem-solving skills. Due to the students' high level of satisfaction regarding the lesson, it is recommended that game-based educational tools such as PICO are also used in addition to different educational methods in enabling students to gain the nursing process, which is the most important competency of nursing undergraduate education. The PICO game will be used repeatedly in teaching and evaluating the nursing process; thus, enabling students to perform more qualified and evidence-based nursing care after graduation. It is recommended to carry out studies in which the PICO game is played repeatedly during NP and others course teaching with large groups in the future. In addition, a long-term evaluation of students' problem-solving skills is recommended.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Ethical Approval

Ethical approval was obtained from the Ege University Ethics Committee (ethical committee approval number: 13/01, date: 26.12.2019)

Consent to Participate and Publish

Written informed consent to participate and publish was obtained from all individual participants included in the study.

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