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Effect of a simulation game on nursing students' reflective thinking skills: a mixed methods study

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Abstract

Background This study aimed to investigate the effect of a simulation game called "The Ward" on reflective thinking skills of senior nursing students.

Methods A convergent mixed methods parallel research design was conducted between February-April 2018. The sample for this study was a convenience sample (n = 23) of senior nursing students. Student Information Form, Reflective Thinking Scale and a structured interview form were used as data collection tools. During study, simulation game was played once a week for seven weeks. Descriptive statistics (frequency, percentage, mean) were used for analyzing data, t test for dependent groups tests were applied to determine differences within group and qualitative data was analyzed with content analysis.

Results After playing the simulation game, nursing students' reflective thinking scores (pre-test = 39.70 ± 5.15; post-test = 67.39 ± 8.13) increased significantly ($p < 0.05$). It was found students noticed their shortcomings and mislearnings by comparing their existing knowledge in setting of teamwork and cooperation created by the game, and consequently students' motivation increased or decreased. The teamwork and collaboration created with in the simulation game caused students to gain self-confidence, to expand their perspectives, to develop effective decision-making skills, to increase their motivation, to discover their own incomplete knowledge, skills or mislearnings.

Conclusions These results support that the simulation games can be used to improve reflective thinking level of students. This finding shows that nursing education curriculum needs to be restructured using new methods such as simulation games aimed at improving students' reflective thinking skills. In this direction nurse educators should be involved with policy making and policy makers to develop strategies to ensure that graduated nursing students should gain reflective thinking skills. In addition nurse executives should encourage using simulation and simulation games in service training to improve nurses' reflective thinking skills and life long learning.

Keywords Nursing students, Nursing education, Reflective thinking, Simulation game, Thinking skills

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Introduction

Nurses play an important role in planning quality patient care, arranging appropriate treatment for the patient and detecting and responding to sudden changes in patient's condition. During this process, nurses are expected to analyze their knowledge and past experiences to take action, to evaluate outcomes, to make changes in their thoughts and behaviors in line with possible and current results, to examine their knowledge and experiences in different situations, in other words to develop self-awareness of cognitive functioning [1–4]. Reflection, which is considered a valuable tool for analysis of nursing practice, is also essential for gaining of higher order thinking skills to provide quality nursing care [4–6]. In order to gain these competencies, reflective thinking skills are considered as a key element in nursing curricula [7, 8].

In order to improve reflective thinking, it is emphasized that learning approaches in which the learner takes an active role through the learning process should be adopted instead of the approach based on the transfer of information by educator. With this educational approach, it is aimed to graduate students who are aware of the cognitive process of retaining knowledge, can express their thoughts clearly, criticize and achieve self-learning, self-evaluation, and self-regulation [2, 9, 10]. Teaching approaches such as case discussions, clinical experiences, reflective writing, socratic questioning, simulation and games are frequently used in nursing education to encourage reflective thinking [7, 10–12].

Simulation games are an important learner-centered teaching technique that the students learn by doing. In gaming process, the student experiences how to find the best solution by obtaining information from many sources, making quick decisions and analyzing options to solve problems [13]. In particular, it is stated that simulation games can be facilitators for nursing students to make a connection between theoretical knowledge and practice. In line with these benefits, educators should try to integrate games into the educational process [14]. Simulation games, which provide an imitation of the real world, consist of the roles and objectives set for each player, rules that limit the behavior of the player in the game, the interaction of the players with each other, the scoring system and the debriefing where feedback is given [15, 16]. Through debriefings, students can discuss how they can perform differently in similar situations [17, 18]. Both the students' analysis of their own actions and the feedback of the facilitators and their peers to the students support the reflective thinking of the students and help them learn from the process through structured debriefings [5, 17–19]. In this direction, it is very important to create active learning environments and to use learning strategies suitable for students in order to meet the learning needs of students and to ensure that they have the knowledge, skills and attitudes required by the twenty-first century [20–22]. For this reason, it is stated that games and simulation are powerful learning tools for new generation learners in achieving the targeted learning outcomes of educational processes [16, 20]. However, less research in the literature has addressed the effects of simulation games and active learning environments on reflective thinking. Therefore, this study tried to reveal the effect of a simulation game on the reflective thinking skills of nursing students with both qualitative and quantitative research.

Methods

Aim

The main aim of this convergent parallel mixed-methods study is to investigate the effect of a simulation game called "The Ward" on reflective thinking skills of senior nursing students.

Design

A convergent (QUAL + QUAN) mixed method design was conducted in the study. In this research process, to triangulate the qualitative and quantitave methods, two datasets have been obtained, analyzed separately, and compared. With this method, providing a larger, different diversity of views increases the reliability and validity of the data and provides stronger conclusions [23]. The quantitative method employed a single group quasi experimental study to assess nursing students' reflective thinking skills. In the qualitative part of the study, a phenomenological approach was used. Focus group interviews were conducted to explore nursing students' reflective thinking throghout the simulation game experience. In the scope of the research, presenting qualitative and quantitative data together has contributed to facilitating explanation and enhancing comprehensibility. In the discussion section, the data obtained through both methods has been presented in a manner that supports each other.

Study group

The sample for this study was a convenience sample of senior nursing students who had been taken the General Practice Course (N = 100) at their last semester. Kolb Learning Styles Inventory was used to ensure the participation of students with all learning styles in the simulation game. All of the students were divided into four groups based on their learning styles as accommodating, assimilating, diverging and converging learning styles. Based on a 95% confidence level and 0.6% confidence interval, the minimum sample size for study was determined as 20. As the application of the game took all day

(09.00–17.00), the students who were willing to participate in the research were selected among these students in line with the suitability of the curricula. As a result, twenty three nursing students, who willingly accepted to participate in the game, were recruited for participate both quantitative and qualitative parts of the research. The study was conducted in the Nursing Skill Laboratory at a university in Türkiye.

Data collection tools

Qualitative data collection tools

In qualitative stage a structured interview form was created in line with Gibbs' Reflective Cycle (Fig. 1). This model is effective in debriefings with various teaching methods such as case studies, games, role-play and simulations to guide reflection [24].

Two-column writings were formed by dividing a page into two parts which students were asked to write about their knowledge and experiences they had acquired during the game on one side of the page and had written about their reflections on the other side of the page [9].

Quantitative data collection tools

Student Information Form and Reflective Thinking Scale were used as quantitative data collection tools.

Student Information Form included questions such as age, gender.

The reflective thinking levels of students was determined with Reflective Thinking Scale designed as a five point Likert scale. The scale was developed by Kember et al. [25] and the Turkish adaptation was made by Başol and Evin Gencel [26]. Test–retest reliability coefficient of the scale was 0.74, Cronbach Alpha Internal Consistency coefficient was 0.77. The lowest score that can be obtained from each dimension is 4 and the highest score is 20; total score from the scale is between min.16 and max.80. The scale consists of 16 items and includes four (4) dimensions: habitual action, understanding, reflection and critical reflection.

- *Habitual action* means that the learned actions are carried out automatically without concious thinking (such as riding a bicycle).
- *Understanding* includes a cognitive process which involves handling the situation as it is, and using existing knowledge.
- *Reflection* includes making a meaning by evaluating the existing situation in accordance with the experiences of the individual and the emergence of a new perspective.
- *Critical reflection,* which is defined as the highest level of reflection, requires the individual to make changes in his / her thoughts, values and beliefs [25–27].

Fig. 1 The Reflective Cycle of Gibbs including example questions from interview form

Intervention

The students were informed about the study process, the use of a voice recorder in the debriefing sessions, the duration of the study, the importance of the continuity for the research and expectations from the students within the scope of the study.

Subsequently, students who agreed to participate in the study were invited to the simulation laboratory. Before the start of the game, Student Information Form and Reflective Thinking Scale were applied. The simulation game was played per a day for seven weeks, with each student experiencing the roles within the game. In the seventh week, the post test was conducted.

Through simulated activities in the context of the game developed by David Stanley, students make decisions for different scenarios with in the team. The game also focusus on team work in a safe, efficient and motivated way to ensure the advancement of the ward. During the game, students are evaluated in six key areas such as patient care, clinical competence, management of the budget, staff morale, professional development activities, leadership and team work [14].

The students were asked to be divided into three groups. A role was determined for each student within the group. These roles include "Ward manager", "Director of nursing", "Senior registered nurse" (2 students), "Clinical nurse" (2 students) and "Team score keeper". After playing the game, the scores obtained by the groups from the activities were collected and the winning group was determined. The groups and roles of students were changed each week. After the simulation game, debriefings were held with student groups. All debriefings were recorded with a voice recorder. Each debriefings took 30–45 min and data saturation was achieved through the interviews. After debriefings students were asked to write two column writings about their reflections in the game. The first researcher worked as an observer and facilitator during the game and the debriefings were held by her. Both researchers working as nurse educators had previously received training in research methods, and were experienced in simulation and debriefing.

Data analysis

Quantitative data were analyzed by statistical software program on computer. Descriptive statistics (frequency, percentage, mean) and t test for dependent groups was used in the analysis of the data. P-values < 0.05 were used to identify notional statistical significance.

Content analysis was used in qualitative data analysis, which may be used as an inductive or deductive way. When there is not enough former knowledge about the phenomenon the inductive approach is recommended [28]. Inductive content analysis was used by the purpose of the study. After each debriefing the recorded data were transcribed on paper by the researcher and after several times of listening the data were typed up in MS Word. The researchers read them several times to obtain full understanding of the data. Words and sentences were determined and labelled with codes. The codes were merged and categorized by their similarities to determine the themes. Finally, a theme was formulated as the expression of the content of the text [29]. The data obtained from debriefings and two-column writings were read and expressions related to reflective thinking were determined and entered into software program for data classification and analysis. Direct quotes were chosen to represent students' views.

Ethical considerations

The study was approved by the Institutional Review Board of the Düzce University (Approval no. 2017/134) and institutional permission was obtained from the Department of Nursing. The researcher explained the purpose and process of the study to the students and informed constent were taken from all of the students.

Rigour and trustworthiness

The researcher acted as a facilitator during debriefings and as an observer during the simulation game. The data obtained with the Reflective Thinking Scale were supported by the data obtained from debriefings and two column writings. Quantitative and qualitative results were discussed in discussion both separately and in support of each other. In order to prevent data loss during the debriefings, a voice recorder was used and students were asked to write two-column writings after debriefings. Validated and reliable quantitative data collection tools were used.

Results

The participants were mostly female (n = 17, 73.9%). The ages of participants ranged from 21 to 28 with an average age of 22.

It was found that the simulation game called "The Ward" significantly increased the reflective thinking skills of students due to the fact that the differences were in favor of the post-tests (Table 1).

Themes on reflective thinking from debriefings

When the distribution of reflective answers given by the students were examined according to weeks, the most reflective answers were given in the 4th week (Table 2).

When participants were asked to interpret the characteristics required by the roles, it was stated that they

Table 1 The pretest and post-test scores of reflective thinking level of students

		n	$\overline{X} \pm SD$	t	*p*	Cohen d
Habitual action	Pre-test	23	7.61 ± 2.50	10.457	**.000***	**2.18**
	Post-test	23	**14.91 ± 3.16**			
Understanding	Pre-test	23	14.26 ± 2.12	5.967	**.000***	**1.24**
	Post-test	23	**17.70 ± 1.82**			
Reflection	Pre-test	23	9.57 ± 2.46	16.206	**.000***	**3.38**
	Post-test	23	**17.87 ± 1.94**			
Critical reflection	Pre-test	23	8.26 ± 1.39	18.623	**.000***	**3.88**
	Post-test	23	**16.91 ± 2.50**			
Reflective Thinking Level	Pre-test	23	39.70 ± 5.15	18.863	**.000***	**3.93**
	Post-test	23	**67.39 ± 8.13**			

Table 2 Distribution of students' reflective answers in debriefings by weeks

	WEEKS							TOTAL	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**f**	**%**
Reflective answers given at description stage	**38**	17	16	17	10	13	16	127	16.5
Reflective answers given at evaluation stage	11	**53**	40	43	23	18	19	**207**	**26.9**
Reflective answers given at analysis stage	16	12	27	**54**	25	23	27	184	23.9
Reflective answers given at conclusion and feelings stages	30	21	24	18	5	18	**49**	165	21.4
Reflective answers given at action plan stage	18	4	16	**29**	8	1	11	87	11.3
f	113	107	123	**161**	71	73	122	770	100
%	14.7	13.9	16.0	**22.9**	9.2	9.5	15.8	100	

needed to have leadership or managerial qualifications in order to be team leader and ward manager (Table 3).

> *I've always felt like a leader, it is a fact I think. when I work as a nurse in the future, I think I will be in the management department. That's probably why I had taken the ward manager role in the game. (Student$_{16}$Week$_{1}$)*

In feelings stage the most common sub-theme was found as learning with fun (f=22, 56.4%). In this context, students stated that they had a lot of fun during the game and learning occured in an enjoyable environment. Teamwork and collaboration (f=23, 11.1%) was the most prominent in the reflections that students expressed their opinions about the simulation game which was applied for seven weeks. In this context, the students stated that they could easily express their own opinions in a democratic discussion environment due to the nature of the simulation game and that they could work as a team for a common purpose in this collaborative environment. On the other hand, during the reflections, it was seen that the most criticism and objections were about the scoring criteria. In the reflective responses of the students towards the negative characteristics of the group or individual, the sub-theme of lack of information (f=25, 12.1%) was most stated (Table 3).

> *We listened to each other well. There were some topics we didn't know, but we listened to each other's ideas and disscussed well. (Student$_{16}$ Week$_{2}$).*

The participants stated *teamwork and collaboration* (f=26, 14.1%) the most as a positive aspect compared to other groups or previous weeks (Table 3).

> *In fact, teamwork enables us to look at different ways, we can evaluate each other from different perspectives, criticize and realize the best points in this way. (Student$_{17}$Week$_{7}$)*

When the participants were asked to evaluate their negative aspects compared to the previous weeks, the sub-theme of being unprepared, unlearnt (f=13, 7.1%) was emphasized most (Table 3).

> *The first activity in the game was the same as last week. If we searched about our mistakes, we would have been more successful. (Student$_{6}$Week$_{3}$)*

Table 3 Themes and sub-themes on reflective thinking from debriefings

Gibbs's Reflective Cycle	Themes		
DESCRIPTION	**Theme 1: Role definitions**		
	Sub-themes	**f**	**%**
	Team leader	17	13.4
	Ward manager	12	9.4
	Theme 2: Determination of roles		
	Sub-themes	**f**	**%**
	Volunteering	**21**	**16.5**
	Negotiation	13	10.2
	Not having taken the role before	11	8.7
	Voting	5	3.9
	Being successful	4	2.1
	Pulling lots	3	2.4
	Theme 3: Features required by the role		
	Sub-themes	**f**	**%**
	Leadership and management	**7**	**5.5**
	Being fair	4	3.1
	Good communication skills	4	3.1
	Being an authoritarian-discipline holder	4	3.1
FEELINGS	**Theme 1: Feelings and thoughts about the game**		
	Sub-themes	**f**	**%**
	Learning with fun	**22**	**56.4**
	Self-confidence	14	35.9
	Feeling responsibility	3	7.7
EVALUATION	**Theme 1: Positive features about the game**		
	Sub-themes	**f**	**%**
	Teamwork and collaboration	**23**	**11.1**
	Negotiating opinions	15	7.2
	Increased different perspectives or creativity	4	1.9
	Theme 2: Negative features about the game		
	Sub-themes	**f**	**%**
	Objections to scoring-not knowing scoring criteria	**26**	**12.6**
		20	9.7
	Differences with practices at clinic	6	2.9
	Interaction of groups	3	1.4
	Repetition of questions or practices		
	Theme 3: Negative features in group or individual		
	Sub-themes	**f**	**%**
	Lack of information	**25**	**12.1**
	Excitement	22	10.6
	Mistakes in practice	19	9.2
	Forgotten theoretical knowledge	16	7.7
	Decrease of motivation	9	4.3
	Non-participation in teamwork	6	2.9
ANALYSIS	**Theme 1: Positive aspects compared to other groups or previous weeks**		
	Sub-themes	**f**	**%**
	Teamwork and collaboration	**26**	**14.1**
	Negotiating opinions	20	10.9
	Good performance/Success	19	10.3
	Developing different perspectives	16	8.7
	Theme 2: Negative aspects compared to other groups or previous weeks		
	Sub-themes	**f**	**%**
	Being unprepared, unlearnt	**13**	**7.1**
	Carelessness-forgetfulness	5	2.7
	Making hasty decisions	5	2.7
	Reduced motivation due to repetitions	3	1.6
	Theme 3: Individual positive features / Individual contributions		
	Sub-themes	**f**	**%**
	Gaining clinical skills	**23**	**12.5**
	Gaining knowledge	17	9.2
	Self-possession	3	1.6
	Effective communication	2	1.1
	Sociability	2	1.1
CONCLUSION	**Theme 1 : Thoughts about the experience gained through the game**		
	Sub-themes	**f**	**%**
	Professional development	**54**	**32.7**
	Perceptible learning experience	34	20.6
	Learning with fun	22	13.3
	Expansion of perspective	18	10.9
	Gaining self-confidence	14	8.5
ACTION PLAN	**Theme 1 : New action plan**		
	Sub-themes	**f**	**%**
	Developing different perspectives	**24**	**27.6**
	Adjusting mistakes in clinical skills	18	20.7
	Complete missing knowledge	13	14.9
	To be more planned	10	11.5
	To be more careful	7	8.0

When the participants were asked about their thoughts about the experience gained through the game, the sub-theme of professional development (f = 54, 32.7%) was highlighted (Table 3).

> *I think this game is a gain for us. We have to communicate with the patient and we are constantly practising here, so I think that all my friends in the group are doing well...This game increased our ability to cope with different situations that we may face in real life as well as our responsibilities for patient care. (Student$_{14}$Week$_{7}$)*

Themes on reflective thinking from two column writings

As a result of content analysis, total 773 reflections made by students about the simulation game were coded under 15 themes that the most reflections are coded to the theme of being aware of missing knowledge, skills or misleading, teamwork and collaboration, increased motivation, expansion of perspective and acquiring new information. In the analysis of the data, it was found that there are relationships between these themes. It was found that students who improved their reflective thinking skills noticed their shortcomings and mislearnings by comparing their existing knowledge and opinions to those of others' in setting of teamwork and collaboration created by the game, and consequently students' motivation increased or decreased. It was also determined that teamwork and collaboration in the game improved students' perspectives and effective decision-making skills and developed self-confidence (Fig. 2).

Discussion

The study aimed to investigate the effect of a simulation game on nursing students' reflective thinking skills. Before the simulation game, the students' total score from the Reflective Thinking Scale was found average. In a study by Kember et al. who developed the scale, it was found that the scores obtained by nursing students and graduated nurses were above the average in contrast to this result [25]. Although there is no other data about reflective thinking levels of nursing students in our country, it is found that critical thinking skills are low and cognitive awareness is high in the studies related to other thinking skills of nursing students [30–34]. Based on the fact that critical thinking is one of the reflective thinking characteristics mentioned in the literature [6, 35], it can be said that the reflective thinking skills of nursing students in our country are average. In line with these results, in a study by Jin and Ji it was found that nursing students' critical thinking abilities were medium level and metacognitive abilities weren't high [3]. Throughout nursing education and after graduation nursing students are expected to identify problems related to the individual, family or society, collect data for the problem, develop solutions, plan, take action and evaluate the results of their actions by using the knowledge and skills acquired. In this process, besides their professional knowledge and skills, it is important to use problem solving, critical thinking and reflective thinking skills to transfer of knowledge to practice. However, the findings show that the reflective thinking levels of nursing

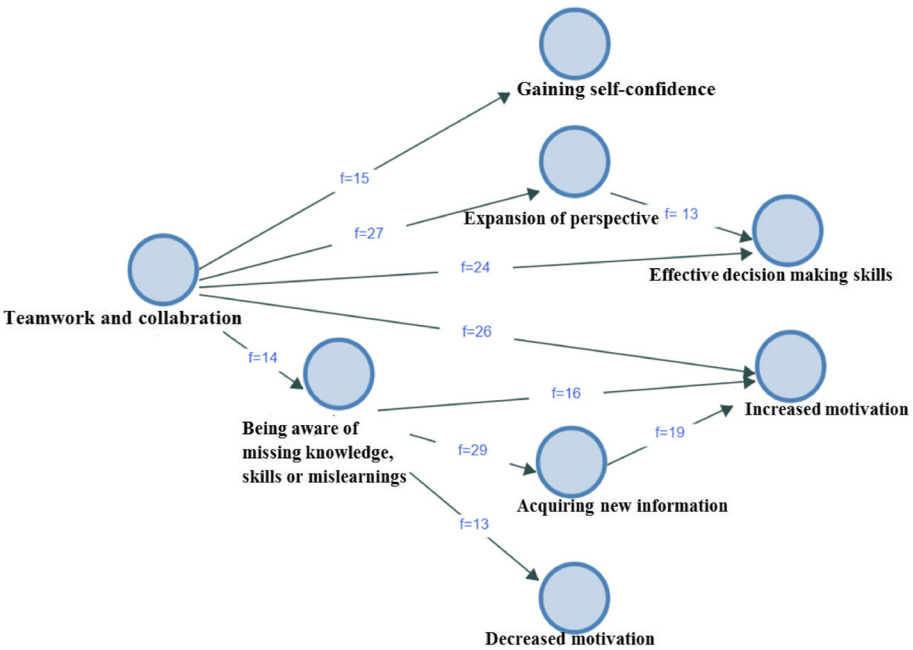

Fig. 2 The relationship between the themes

students are not at the desired level. The result obtained in this context is meaningful in terms of reminding that nursing education cirruculum needs change for gaining reflective thinking skill.

At the end of the 7-week period, the total mean scores of the students' reflective thinking scores were increased. Qualitative data from debriefing sessions and two-column writings also support this finding. It is seen that the reflective answers of the students increased from 1st week to the 4th week. However, after the 4th week there was a decrease in the reflective responses of the students. This can be attributed to the fact that students play the same scenarios each week and participate in the game after repetitions without much thought and unaware.

It was found that there was a significant difference students' scores between all subdimensions of the scale before and after the playing game and this difference was in favor of the posttests. In particular, this difference was found to be the highest in the understanding and reflection levels. In a study examining the effect of high-fidelity simulation on reflective thinking skills of nursing students, participants were found to achieve the highest scores in understanding and reflection levels [36]. This finding also aligns with literature which refer to nursing students' reflective thinking skills [25, 37]. In nursing education, students are thought theory and skills mostly in classrooms and then integrate this theoretical learning into clinical practice. So it is expected for nursing students to gain understanding and reflection skills by questioning what they know and how they can use this knowledge in different situations. At this level, it is expected from students to become aware of their own learning and actions, whether consciously or unconsciously, and analyze the results of their actions. The theme being aware of missing knowledge, skills or mislearnings which stated the most in students' two-column learning writings, also supports this result.

Inferred from some of the reflections written by the students, it is determined that some themes are related to each other. It's been spotted that the setting of teamwork and collabration created by the simulation game enabled students to gain confidence, widen their perspectives, improve their decision-making skills, increase their motivation and be aware of their lacking knowledge, skills or mislearnings during the learning process. Stating that the most significant feature of the simulation game was the atmosphere of teamwork and cooperation it brought forth, the students expressed that different opinions were easily expressed due to the cooperation among team members, that a consensus was reached by discussing these opinions, and that the unity in the group helped their learning process. Taking different views into account and discussing different perspectives were identified as neccessities for effective decision-making and problem-solving, and the students stated that they learnt to approach things with different perspectives during the game. These reflections with expressions of correcting lacking or faulty learnings, improving their perspectives on their jobs, making changes of their perspectives and existing views are evaluated as critical reflections. Collected quantitive data supports these results. The students' scores from critical reflection dimension of Reflective Thinking Scale increased after playing the game for seven-weeks. This shows that the students' critical reflection levels are high. In this respect, it is thought that simulation and simulation games, in which students provide feedback and reflective thinking skills are developed in a safe, controllable environment, should be organized to create real clinical learning environments for effective learning.

Limitations

The sample was drawn from a single nursing department can be considered a limitation of this study since it may limit generalizability. The researchers who carried out debriefings worked as educators at the same nursing department and had known some of the students also can be a limitation. However, during the simulation game the evaluations carried out by other students and were not used for the purpose of grading.

Conclusion

Within the scope of nursing education reflective thinking is a core skill for the integration of theoretical knowledge and clinical experience. To improve reflective thinking skill in nursing cirricula is vital to the integrity- and future of the nursing profession. This study revealed that teamwork and collaboration environment created with the simulation game caused students to improve reflective thinking skills, to gain self-confidence, to expand their perspectives, to develop effective decision-making skills, to increase their motivation, to discover their own incomplete knowledge, skills or mislearnings. Our findings suggest that simulation games could be used to improve nursing students' cognitive skills and their readiness for clinical situations they can face in real life. Therefore, the use of games in nursing education should be supported and should be integrated into nursing curricula. In this direction nurse educators should be involved with policy making and policy makers to develop strategies to ensure that graduated nursing students should gain reflective thinking skills. In addition nurse executives should encourage using simulation and simulation games in service training to improve nurses' reflective thinking skills and life long learning.

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Authors' contributions
The conception and design of the study: AK, AA. Acquisition of data: AA. Analysis and interpretion of data: AK, AA. Revising the article for important intellectual content: AK, AA. Final approval of the version to be submitted: AK, AA. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved: AK, AA.

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Availability of data and materials
The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to the privacy of participants.

Declarations

Ethics approval and consent to participate
The study was conducted following Declaration of Helsinki. The study was approved by the Institutional Review Board of the Duzce University (Approval no. 2017/134) and institutional permission was obtained from the Department of Nursing. The researcher explained the purpose and process of the study to the students and informed constent were taken from all of the students.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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