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The Effect of Bingo Games and Board Games Applied to Nursing Students in Pharmacology Lessons On Lesson Motivation

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ABSTRACT

Objective: This study aims to investigate the effect of bingo games and board games methods on the motivation levels of nursing students taking pharmacology courses. **Materials and Methods:** A quasi-experimental study with a post-test only design was conducted with 72 nursing students at a state university in Türkiye between March and April 2023. Data collection was carried out using an Information Form to gather demographic data, a Bingo Game played with cards, and a Board Game consisting of a game board, game pieces, drawing data cards, drawing blanks question cards, winding paths, and scoring mechanisms. The students were divided into two groups, Group A and Group B, by the student affairs office for administrative purposes, unrelated to the study. Both groups participated in play sessions after pharmacology lectures throughout the semester. Group A played a modified version of the bingo game that included pharmacology concepts, while Group B played a modified board game incorporating pharmacology concepts. The instructional material motivation of the students was assessed with using the Instructional Materials Motivation Scale (IMMS). The study followed a structured approach within the specified time frame, utilizing the bingo and board games as interactive teaching tools in the pharmacology course. All topics related to the pharmacology course were taught to both groups by the same instructor for two hours in one day a week throughout the semester. **Results:** The mean IMMS total score was 132.91±20.06 for the bingo group. The mean IMMS score was 124.80±20.54 for the board game group. The mean scores of the IMMS for total and sub-dimensions were not significantly different between the bingo game and board game groups ($p > 0.05$). **Conclusion:** The study found that there was no significant difference in the motivation levels of nursing students who used bingo or board games as reinforcement in pharmacology lessons.

Keywords: Pharmacology, Nurse education, Nursing student, Motivation, Bingo game, Board game.

Hemşirelik Öğrencilerine Farmakoloji Derslerinde Uygulanan Bingo ve Masa Oyunlarının Ders Motivasyonuna Etkisi

ÖZ

Amaç: Bu çalışma farmakoloji dersi alan hemşirelik öğrencilerinin motivasyon düzeylerine bingo oyunu ve masa oyunu yöntemlerinin etkisini araştırmayı amaçlamaktadır. **Gereç ve Yöntem:** Mart ve Nisan 2023 tarihleri arasında Türkiye'deki bir devlet üniversitesinde okuyan 72 hemşirelik öğrencisi ile sadece son test tasarımına sahip yarı deneysel bir çalışma yürütülmüştür. Veri toplama işlemi, demografik verileri toplamak için bilgi formu, kartlarla oynanan bir Bingo Oyunu ve bir oyun tahtası, oyun parçaları, çizim veri kartları, boşluk çekme soru kartları, dolambaçlı yollar ve puanlama mekanizmalarından oluşan bir masa oyunu kullanılarak gerçekleştirilmiştir. Öğrenciler, öğrenci işleri tarafından çalışmayla ilgisi olmayan idari amaçlarla A Grubu ve B Grubu olmak üzere iki gruba ayrılmıştır. Her iki grup da dönem boyunca farmakoloji derslerinden sonra oyun oturumlarına katıldı. A Grubu, farmakoloji kavramlarını içeren bingo oyununun değiştirilmiş bir versiyonunu oynarken, B Grubu, farmakoloji kavramlarını içeren değiştirilmiş bir masa oyunu oynadı. Öğrencilerin öğretim materyali motivasyonları Öğretim Materyalleri Motivasyon Ölçeği (ÖMMÖ) kullanılarak değerlendirildi. Çalışma, farmakoloji dersinde interaktif öğretim araçları olarak bingo ve masa oyunlarını kullanarak, belirlenen zaman dilimi içerisinde yapılandırılmış bir yaklaşım izlemiştir. Farmakoloji dersi ile ilgili tüm konular her iki gruba da dönem boyunca haftada bir gün ikişer saat aynı öğretim elemanı tarafından anlatılmıştır. **Bulgular:** Öğretim Materyalleri Motivasyon Ölçeği toplam puan ortalaması bingo grubu için 132.91±20.06'dır. Masa oyunu grubunun ÖMMÖ puan ortalaması 124.80±20.54'tür. Öğretim Materyalleri Motivasyon Ölçeği toplam ve alt boyutlarının ortalama puanları bingo oyunu ve masa oyunu grupları arasında anlamlı farklılık göstermemektedir ($p > 0.05$). **Sonuç:** Çalışmada, farmakoloji derslerinde pekiştirici olarak bingo veya masa oyunu kullanan hemşirelik öğrencilerinin motivasyon düzeylerinde anlamlı bir fark olmadığı bulunmuştur.

Anahtar kelimeler: Farmakoloji, Hemşire eğitimi, Hemşirelik öğrencisi, Motivasyon, Bingo oyunu, Masa oyunu.

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INTRODUCTION

Nursing education equips future nurses with the knowledge, skills, and attitudes they need to deliver safe, effective, and quality care to patients. However, it has become difficult for nursing educators to focus nursing students on their courses (Brown, 2018). Especially in basic science courses (such as pharmacology, anatomy, and physiology), traditional education methods do not attract students' interest, and they often have difficulty learning the subjects (Xu, 2016).

Pharmacology is a core course in nursing education, and it is important for nursing students' safe drug administration in clinical settings. However, traditional pharmacology teaching methods, which usually involve memorization without practical application, are not effective in achieving this goal (Yiin & Chern, 2023). Pharmacology is a course that many nursing students approach with fear. Students in these courses often find it difficult to learn the language of pharmacology while at the same time being forced to memorize large amounts of new information. In nursing schools, pharmacology courses are often taught traditionally, through dense and lengthy PowerPoint slides, and students may remember some of this information (McEnroe-Petitte & Farris, 2020). As the field of education evolves, innovative and engaging approaches to teaching have become increasingly important in ensuring effective learning outcomes. In recent years, alternative teaching methods such as gamification have gained popularity in nursing education to increase student engagement and motivation (Elzeky, Elhabashy, Ali, & Allam, 2022). Gamification is the application of game design principles to non-game contexts to make them more engaging and motivating (McEnroe-Petitte & Farris, 2020). Bingo and board games are two examples of gamification techniques used to increase student motivation and engagement in nursing education (Brown, 2020; Chang & Yeh, 2021; Hsieh, 2016). The first of these approaches is the inclusion of board games in the academic curriculum. Studies have demonstrated the benefits of implementing gamification strategies in various educational settings, including nursing education (Chang et al., 2022; Wu, Chen, Hwang, & LEE, 2023). In particular, board games are used in courses due to their effectiveness in supplementing traditional learning methods by increasing student engagement and promoting better recall of course materials (Luchi, Cardozo, & Marcondes, 2019; McEnroe-Petitte & Farris, 2020). As a result, the inclusion of board game interventions can offer nursing students a better learning environment. Board games have been found to increase knowledge retention, change real-world behaviors, and influence therapeutic outcomes through their ability to make learning more fun and easier (Lickiewicz, Hughes, & Makara-Studzińska, 2020). The second interaction method is the use of bingo (Brown, 2020). Similar to the board game, the bingo game also encourages student for learning (Brown, 2020; Chang et al., 2022; Hsieh, 2016).

Games have been used in nursing education to improve cognitive function, satisfaction, motivation, and learning in a variety of ways (Branney & Priego-Hernández, 2018; Chang et al., 2022; Fernandes, Marcolan, & Rosado, 2022; Xu, 2016). Therefore, studies on the effectiveness of these techniques in increasing nursing students' motivation and engagement in pharmacology courses are needed. This study aims to investigate the effect of bingo games and board games methods on the motivation levels of nursing students taking pharmacology courses.

Research Question

What is the effect of the application of bingo games and board games methods on the motivation levels of nursing students taking pharmacology courses?

MATERIALS AND METHODS

Research design, setting, and time frame

A quasi-experimental study with a post-test only design was conducted with nursing students at a state university in Türkiye between March and April 2023. At the beginning of each semester at the state university where the study was conducted, the students are divided into two groups, Group A and Group B, by the student affairs office. This division is unrelated to the specific study on bingo games and board games in pharmacology courses. The group division is a common practice for administrative purposes within the university and is not influenced by the study itself.

The population and the sample of the research

The study was conducted with a sample of 90 first-year nursing students from a state university in Türkiye. The inclusion criteria for the study were defined as follows: being a first year nursing student, not having received education within the scope of pharmacology courses before, and voluntary participation. The exclusion criteria for the study included students who were absent during the data collection phase or who withdrew from the study for any reason. The study was completed with 72 students after nine students in each group were absent during the data collection phase.

Data collection

"Information Form", "Bingo Game and Board Game", and "Instructional Materials Motivation Scale (IMMS)" were used to collect the data.

Information Form: A information form was developed by the researchers to collect demographic data from the participants, such as their age, gender, socio-economic status, and level of satisfaction with games.

BINGO Game: Bingo is a game played with cards; each bingo card has five columns and five rows, and each card has 25 boxes with numbers. Winning five consecutive squares vertically, horizontally, or from corner to corner is enough to succeed in bingo. Students who knew the questions tried to complete the sequence by closing that number (Barros, Sarmento, Gutteres, Belo, & Goncalves, 2022; Brown, 2020).



Figure 1. Bingo card

Board Game: A game board and game pieces were prepared for the board game. It consisted of a drawing data card, drawing blanks question card blanks, winding paths, and scoring for returning to the beginning for unknown questions and going to the final. In the data card, questions on all subjects of pharmacology, information about drugs, ways of administration, and nursing care were prepared. Before starting the game, the rules of the game were explained to the students.

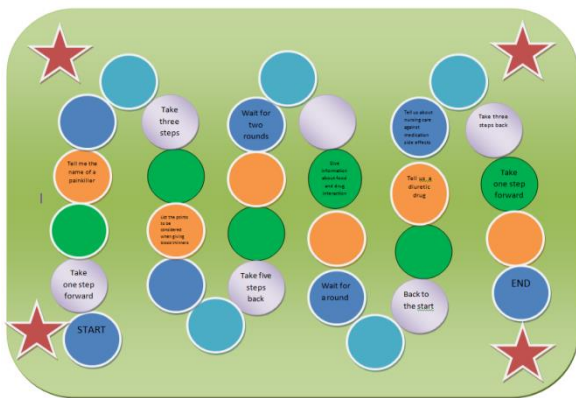


Figure 2. Board game.

Instructional Materials Motivation Scale (IMMS): The IMMS is a 33-item, four-dimensional (attention, relevance, confidence, satisfaction) measurement tool developed by Keller (2009) based on the Attention, Relevance, Confidence, Satisfaction (ARCS) Model. It was adapted into Turkish by Dinçer and Doğanay (2016). The original IMMS scale has 36 items. The scores range from 33 to 165, with higher scores indicating higher levels of motivation towards the instructional material. The Cronbach alpha value for the whole scale is 0.96. In this study, the IMMS Cronbach alpha value was found to be 0.79.

Application and instructional material

At the beginning of each semester at the state university where the study was conducted, the students are divided into two groups, Group A and Group B, by the student affairs office. This division is unrelated to the specific study on bingo games and board games in pharmacology courses. The group division is a common practice for administrative purposes within the university and is not influenced by the study itself.

Throughout the semester, after the pharmacology lecture, both Group A and Group B participated in play sessions. The game sessions took place regularly, in particular once at the end of each lecture. After the lecture, students in Group A played a modified version of the bingo game that included pharmacology concepts, while students in Group B played a modified board game that also included pharmacology concepts.

All topics related to the pharmacology course were taught to both groups by the same instructor using the traditional PowerPoint method for 2 hours between 08:30 and 10:10 one day a week during the semester. Traditional PowerPoints were prepared by utilizing the mentioned sources (Frandsen & Pennington, 2014; Harris, Nagy, & Vardaxis, 2014). At the end of the lesson, the students in group A played a bingo game adapted to the pharmacology course by the researchers, and group B played a board game adapted to the pharmacology course. After the game, all groups filled out the "Student Information Form" and "IMMS".

In the study, both the Bingo game and the board game were played by all students at the same time. Here's some further explanatory information about each game and how they were conducted:

Bingo Game: Bingo is a game played with cards, where each card has 5 columns and 5 rows, totaling 25 boxes with numbers. Students, who knew the questions, tried to complete a sequence by closing the corresponding number on their bingo card. The game was played in a group setting, with all participants playing simultaneously. The correct answers were checked during the game by the instructor and a student not participating in the game. Winners in the bingo game were determined by reaching a certain pattern on the bingo cards. The aim of the game was to mark or cover five consecutive squares vertically, horizontally or diagonally. During the game, as the instructor or designated person asked questions related to the pharmacology course, students who knew the answers marked or covered the corresponding number on the bingo cards. When a student successfully marked a pattern of five consecutive squares in any direction (vertically, horizontally or diagonally), student said "Bingo" to indicate that student had completed the required pattern and won the game. The game had multiple winners. The first student to obtain the winning pattern and say "Bingo" would be considered the winner of that round of the game.

Board Game: The board game included a game board, game pieces, drawing data cards, drawing blanks question cards, winding paths, and scoring for returning to the beginning in case of unknown questions and progressing towards the final. The data cards contained questions related to various subjects of pharmacology, including information about drugs, ways of administration, and nursing care. Before starting the game, the rules of the board game were explained to the students. Similar to the Bingo game, all students played the board game simultaneously in a group setting. In the board game, the winner of the game must answer the

questions on the game board and reach the goal. At the end of the game, the person who knows the most questions and reaches the goal wins the game. There is one minute for each question to be known. If the question is not answered within one minute, that student is waiting for one round of penalty time. The questions in both groups were prepared to reinforce the topics covered in the course (Frandsen & Pennington, 2014; Harris, Nagy, & Vardaxis, 2014). The playing time of both games was 45 minutes.

Data analysis

The data were analyzed with using SPSS 22, a statistical software program. The following statistical parameters and tests were used: frequency, mean, percentage, standard deviation, independent t-test, Mann-Whitney U test, and chi-square test. A p-value of 0.05 was considered to be statistically significant.

Ethical considerations

To implement the study and collect the data, permissions were obtained from the Selçuk University, Akşehir Kadir Yallagöz Health School (15.12.2022-E.424040), and from Selçuk University, Faculty of Medicine, Local Ethics Committee (18.01.2023-E.431666). Verbal and written consents from the students who would participate in the study, and permission to use the scale from the relevant persons were also obtained.

RESULTS

Table 1 shows the distribution and comparisons of the bingo and board game groups according to their individual and family characteristics. It was seen that 47.2% of the students in the bingo game group were between the ages of 18-19, 86.1% were female, 88.9% lived in a nuclear family, 52.8% had good academic achievement, 77.8% played a game related to education in the lesson, 100% liked the bingo game applied, 97.2% thought that the applied game contributed to learning, and they wanted to use game materials in other lessons.

It was determined that 58.3% of the students in the board game group were between the ages of 18-19, 66.7% were female, 72.2% lived in a large family, 50% had average academic achievement, 91.7% played a game related to education in the lesson, 94.4% liked the applied board game, 91.7% thought that the applied game contributed to learning, and 94.4% were willing to use game materials in other lessons. The two groups were comparable in terms of control variables, as there were no significant differences in the distribution of individual and familial characteristics ($p=0.178$, $p=0.052$, $p=0.148$, $p=0.775$).

Table 1. The individual and family characteristics of the two groups were compared (n = 72).

Characteristics	Bingo game (n=36)		Board game (n=36)		Test and significance value		
	n	%	n	%	χ^2	p	
Age	18-19	17	47.2	21	58.3	7.635	0.178
	20-21	17	47.2	15	41.7		
	22 and above	2	5.6	-	-		
Gender	Female	31	86.1	24	66.7	3.773	0.052
	Male	5	13.9	12	33.3		
Family type	Nuclear family	32	88.9	6	16.7	3.824	0.148
	Extended family	4	11.1	26	72.2		
	Fragmented family	-	-	4	11.1		
Family income	Income less than expenditure	5	13.9	6	16.7	0.511	0.775
	Income equal to expenditure	25	69.4	26	72.2		
	Income more than expenditure	6	16.7	4	11.1		
Academic success status	Good	19	52.8	17	47.2	0.229	0.892
	Moderate	17	47.2	19	52.8		
Previous experience of playing games in class	Yes	28	77.8	33	91.7	2.683	0.101
	No	8	22.2	3	8.3		
Appreciation of the implemented game	Yes	36	100.0	34	94.4	2.057	0.151
	No	-	-	2	5.6		
Contribution of the applied game to learning	Yes	35	97.2	33	91.7	1.059	0.303
	No	1	2.8	3	8.3		
Request to use play activities in other lessons	Yes	35	97.2	34	94.4	0.348	0.555
	No	1	2.8	2	5.6		

* χ^2 = Pearson Chi-square test.

Table 2 shows the mean scores of the IMMS and its sub-dimensions for the bingo game and board game groups. The mean scores of the attention and concern sub-dimensions of the IMMS were 39.44 ± 5.68 and 31.55 ± 9.30 , respectively, for the bingo group. The mean scores of the trust and satisfaction sub-dimensions of the IMMS were 37.55 ± 8.53 and 24.36 ± 3.91 , respectively. The mean total score of the IMMS was 132.91 ± 20.06 .

The mean scores of the attention, interest, confidence, and satisfaction sub-dimensions of the IMMS for the board game group were 37.16 ± 6.42 , 28.61 ± 5.00 , 35.33 ± 9.13 , and 23.69 ± 5.73 , respectively. The mean IMMS score was 124.80 ± 20.54 . The mean IMMS scores and all sub-dimension mean scores of the bingo game group and the board game group were not significantly different.

Table 2. Mean scores of IMMS and its sub-dimensions for Bingo and Board game groups (n=72).

	Bingo game	Board game	t/U	p
	Mean ± SD	Mean ± SD		
Attention	39.44±5.68	37.16±6.42	U= 507.50**	0.113
Relevance	31.55±9.30	28.61±5.00	U=546**	0.249
Confidence	37.55±8.53	35.33±9.13	t=1.067*	0.290
Satisfaction	24.36±3.91	23.69±5.73	U=525**	0.164
Total IMMS	132.91±20.06	124.80±20.54	U=511**	0.123

*Independent groups t-test, **Mann-Whitney U test.

DISCUSSION

Motivating students in nursing education is very important to increase their learning experience and participation. In recent years, gamification techniques have attracted attention as practical tools to promote motivation and active participation in educational settings. This study aims to investigate the potential benefits of two gamification methods, bingo and board games, in increasing student motivation in nursing education.

A comparison of the distribution of individual and familial characteristics between the groups revealed no significant differences (Table 1). The current finding, expressed by almost all students in both groups, revealed that they would like to use game materials in other courses, and it supports the idea that these techniques could be interesting and motivating for students. The absence of a control group without gamification intervention in this study limits our ability to draw firm conclusions about the effects of these techniques on motivation and learning outcomes. However, the high levels of satisfaction and perceived effectiveness reported by students in both groups provide some evidence for the potential benefits of gamification in nursing education. The finding that 100% of the students in the bingo game group enjoyed the game is particularly noteworthy, as it suggests that this method may be particularly appealing to nursing students. However, it is important to note that individual preferences for gamification techniques could vary widely, and other factors such as the specific learning context and characteristics of the student population may also influence the effectiveness of these interventions. Previous studies have also shown that nursing students are satisfied with bingo and board games in courses, and those games have an effect on their learning motivation (Brown, 2020; Lin, Lin, Wang, Su, & Huang, 2021; McEnroe-Petitte & Farris, 2020; Sailer, Hense, Mayr, & Mandl, 2017).

This study examined the effectiveness of bingo and board games in increasing student motivation in nursing education. The IMMS scores were not significantly different between the bingo and board game groups for any of the sub-dimensions. This finding is consistent with previous research, which has shown that both bingo and board games can be effective in motivating students (Branney & Priego-Hernández, 2018; Manning-Stanley, Pickering, Bonnett, & MacKay,

2022). In a study by Koivisto and Haavisto (2018), it was found that gamification interventions in nursing education had a positive effect on learning outcomes, but the effect sizes were generally small and not significant (Koivisto et al., 2018). In a study conducted by Aras and Çiftçi (2021), it was found that a game-based learning approach and a question-and-answer method using Kahoot! did not provide significant improvements in student motivation and learning outcomes in the infection control course (Aras & Çiftçi, 2021). The lack of a significant difference in the study may be due to factors such as the level of competition and feedback provided in the game. It may be linked to different types of students and learning contexts. Therefore, it should be noted that further research is needed to identify the most effective gamification strategies. The findings of this study are largely consistent with existing literature on gamification in nursing education, which suggests that active student engagement is a key factor in promoting motivation and learning outcomes (Branney & Priego-Hernández, 2018; Koivisto et al., 2018; Maharjan et al., 2022; Manning-Stanley et al., 2022).

The effectiveness of any teaching method in nurse education depends on the active participation of the students. While the current study suggests that both bingo and board game methods may be equally effective in increasing motivation, it could be considered that neither method has superiority over student motivation. Although the current study focused on immediate effects, examining the sustainability of motivational benefits over time would be valuable for educators and curriculum planners. Furthermore, investigating the potential synergistic effects of combining gamification techniques with other instructional strategies may further increase student motivation and learning outcomes (Brown, 2020; Chang et al., 2022; Hsieh, 2016; Ozdemir & Dinc, 2022).

Limitations of study

The study's findings may not be generalizable to other populations of nursing students due to its limited sample size and single-university setting. The absence of a control group without gamification intervention in this study limits our ability to draw firm conclusions about the effects of these techniques on motivation and learning outcomes.

CONCLUSION

The study indicated no significant difference in the effectiveness of bingo and board games in increasing the motivation levels of nursing students taking pharmacology courses. Therefore, it could be suggested that both bingo and board game methods could be used as alternative teaching methods to increase nursing students' motivation in pharmacology courses. The effectiveness of these methods may be affected by the specific characteristics of the students and the context in which they are used.

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Conflict of Interest

The author declare no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Author Contributions

Plan, design: BM, AYK; **Material, methods and data collection:** BM, AYK; **Data analysis and comments:** BM, AYK; **Writing and corrections:** BM, AYK.

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REFERENCES

- Aras, G. N., & Çiftçi, B. (2021). Comparison of the effect of reinforcement with question-answer and kahoot method on the success and motivation levels of nursing students: A quasi-experimental review. *Nurse Education Today*, 102, 104930. <https://doi.org/10.1016/j.nedt.2021.104930>.
- Barros, I., Sarmiento, J., Gutierrez, C., Belo, F., & Goncalves, A. (2022). Using bingo to teach english plural nouns. *ISCE: Journal of Innovative Studies on Character and Education*, 6(2), 312-326.
- Branney, J., & Priego-Hernández, J. (2018). A mixed methods evaluation of team-based learning for applied pathophysiology in undergraduate nursing education. *Nurse Education Today*, 61, 127-133. <https://doi.org/10.1016/j.nedt.2017.11.014>.
- Brown, T. (2018). Using Jenga to teach risk management concepts to senior nursing students. *Journal of Nursing Education*, 57(12), 765-765. <https://doi.org/10.3928/01484834-20181119-12>.
- Brown, T. (2020). BINGO! Patient safety. *Nurse Educator*, 45(1), 60. <https://doi.org/10.1097/NNE.0000000000000737>.
- Chang, W.-L., & Yeh, Y.-c. (2021). A blended design of game-based learning for motivation, knowledge sharing and critical thinking enhancement. *Technology, Pedagogy and Education*, 30(2), 271-285. <https://doi.org/10.1080/1475939X.2021.1885482>.
- Chang, Y.-S., Hu, S. H., Kuo, S.-W., Chang, K.-M., Kuo, C.-L., Nguyen, T. V., & Chuang, Y.-H. (2022). Effects of board game play on nursing students' medication knowledge: A randomized controlled trial. *Nurse Education in Practice*, 63, 103412. <https://doi.org/10.1016/j.nepr.2022.103412>.
- Diñçer, S., & Doğanay, A. (2016). Turkish adaptation study of the motivation scale for instructional material (IMMS). *Primary Education Online*, 15(4). <https://doi.org/10.17051/ieo.2016.19056>.
- Elzeky, M. E., Elhabashy, H. M., Ali, W. G., & Allam, S. M. (2022). Effect of gamified flipped classroom on improving nursing students' skills competency and learning motivation: a randomized controlled trial. *BMC nursing*, 21(1), 316. <https://doi.org/10.1186/s12912-022-01096-6>.
- Fernandes, C. N., Marcolan, L. F., & Rosado, S. R. (2022). *The efficiency of using games in the teaching and learning process about burn victims*. Paper presented at the EDULEARN22 Proceedings. <https://doi.org/10.21125/edulearn.2022.1542>.
- Frandsen, G., & Pennington, S. S. (2014). Abrams' clinical drug therapy rational drug applications for nurses. Akademisyen Medical Bookstore.
- Harris, P., Nagy, S., & Vardaxis, N. (2014). *Mosby's dictionary of medicine, nursing and health professions-australian & new zealand edition-eBook*. Elsevier Health Sciences.
- Hsieh, C. (2016). Bingo! team-based game in english medical terminology for baccalaureate nursing students. *International Archives of Nursing and Health Care*, 2(2), 2-3.
- Keller, J. (2009). *Motivational design for learning and performance: the ARCS model approach*. Springer Science & Business Media.
- Koivisto, J.-M., Haavisto, E., Niemi, H., Haho, P., Nylund, S., & Multisilta, J. (2018). Design principles for simulation games for learning clinical reasoning: A design-based research approach. *Nurse Education Today*, 60, 114-120. <https://doi.org/10.1016/j.nedt.2017.10.002>.
- Lickiewicz, J., Hughes, P., & Makara-Studzińska, M. (2020). The use of board games in healthcare teaching. *Nursing Problems/Problemy Pielęgniarstwa*, 28(2), 71-74. <https://doi.org/10.5114/ppiel.2020.98766>.
- Lin, H.-C. K., Lin, Y.-H., Wang, T.-H., Su, L.-K., & Huang, Y.-M. (2021). Effects of incorporating augmented reality into a board game for high school students' learning motivation and acceptance in health education. *Sustainability*, 13(6), 3333. <https://doi.org/10.3390/su13063333>.
- Luchi, K. C. G., Cardozo, L. T., & Marcondes, F. K. (2019). Increased learning by using board game on muscular system physiology compared with guided study. *Advances in physiology education*, 43(2), 149-154. <https://doi.org/10.1152/advan.00165.2018>.
- Maharjan, N., Kuroda, K., Silwal, G., Toyama, S., Ominato, Y., Tsuchida, Y., Ichitsubo, M. (2022). Implementation of design based learning for the development of SDGs educational games. *Journal of Technology and Science Education*, 12(2), 496-509. <http://dx.doi.org/10.3926/jotse.1578>.

- Manning-Stanley, A., Pickering, V., Bonnett, L., & MacKay, S. (2022). *The use of a flipped-classroom and team-based learning (tbl) approach: replacing a standard lecture with an interactive 'bingo' session to deliver undergraduate content on abdominal pathology*. Paper presented at the INTED2022 Proceedings. <https://doi.org/10.21125/int.ed.2022.1615>.
- McEnroe-Petite, D., & Farris, C. (2020). Using gaming as an active teaching strategy in nursing education. *Teaching and Learning in Nursing, 15*(1), 61-65. <https://doi.org/10.1016/j.teln.2019.09.002>.
- Ozdemir, E. K., & Dinc, L. (2022). Game-based learning in undergraduate nursing education: A systematic review of mixed-method studies. *Nurse Education in Practice, 103375*. <https://doi.org/10.1016/j.nepr.2022.103375>.
- Sailer, M., Hense, J. U., Mayr, S. K., & Mandl, H. (2017). How gamification motivates: An experimental study of the effects of specific game design elements on psychological need satisfaction. *Computers in human behavior, 69*, 371-380. <https://doi.org/10.1016/j.chb.2016.12.033>.
- Wu, C.-S., Chen, M.-F., Hwang, H.-L., & LEE, B.-O. (2023). Effectiveness of a nursing board games in psychiatric nursing course for undergraduate nursing students: an experimental design. *Nurse Education in Practice, 103657*. <https://doi.org/10.1016/j.nepr.2023.103657>.
- Xu, J.-h. (2016). Toolbox of teaching strategies in nurse education. *Chinese Nursing Research, 3*(2), 54-57. <https://doi.org/10.1016/j.cnre.2016.06.002>.
- Yiin, S.-J., & Chern, C.-L. (2023). The effects of an active learning mechanism on cognitive load and learning achievement: A new approach for pharmacology teaching to Taiwanese nursing students. *Nurse Education Today, 124*, 105756. <https://doi.org/10.1016/j.nedt.2023.105756>.