Jurnal
Berita Ilmu Keperawatan

Jurnal Berita Ilmu Keperawatan
Vol. 16 (1), 2023
p-ISSN: 1979-2697
e-ISSN: 2721-1797

# *The Effect of Game-Based Learning on Motivation and Learning Strategies of Nursing Students in Occupational Health Nursing Course*

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***Abstract:*** *Nurses are the backbone of the health system and constitute the largest professional group of the health system. Nurses must be prepared as competently during their academic and practical education to respond to the health requirements of the community. Nursing education is negatively affected by an increasing number of nursing students, a lack of sufficient and eligible clinical settings, the inadequate number of clinical instructors, and faced to challenges of health systems such as outbreaks. As a result, there is a need for new learning approaches to increase the quality of nursing education. Purpose of this research was to assess the effect of game-based learning on nursing students' motivation and learning strategies. A quasi-experimental study was conducted from November 2019 to January 2020, 74 nursing students participated in the study. The Sociodemographic Characteristics Question Form and Motivated Strategies for Learning Questionnaire were used for data collection tool. The mean age of nursing students is 21.45±0.62. 85.1% of them are women. When the students' mean of the Motivation Scale pretest and posttest subscales were compared, a statistically significant difference was found (p=0.01). There were statistically significant differences between the pretest and posttest Learning Strategies Scale subscale scores, nursing students obtained higher mean scores from critical thinking, help seeking, peer learning, metacognitive self-regulation subscales at the posttest (p=0.01). As a result of this study, it was found that Game-Based Learning is a useful method to increase motivation and enhance the learning strategies of nursing students.*

***Keywords:*** *Game-Based Learning, Kahoot, Learning Strategies, Motivation, Nursing Students*

## INTRODUCTION

Game-based learning (GBL) or gamification is defined as the use of games as a learning tool. Although GBL is a long-used learning tool, it turns into a strong learning and teaching approach for the generation Z (digital generation) when combined with technology (Bicen & Kocakoyun, 2018). As more positive results are obtained compared to traditional learning methods (Wang & Lieberoth, 2016), GBL is quite widely used, recently (Graham, 2015; Ismail & Mohammad, 2017). Despite the use of GBL is still a very new approach in the education of health sciences, it is considered an encouraging approach for teaching applied sciences like nursing (Davidson, & Candy, 2016).

Several studies showed that GBL is effective in learning performance (Sarkar, Ford & Manzo, 2017), motivation (Bawa, 2019; Hung, 2017; Wichadee & Pattanapichet, 2018), participation in learning (Cameron & Bizo, 2019; Wang & Lieberoth, 2016; Wichadee & Pattanapichet, 2018) and classroom dynamics (Hung, 2017; Wang & Lieberoth, 2016), interaction with lecturers and peers (Hung, 2017), and stress (Ismail et al., 2018; Muhridza, Rosli, Sirri, & Samad, 2018). GBL also enables students to support cognitively,

motivationally, emotionally and socially, to develop critical thinking (Tewthanom, 2019), and to increase their problem-solving skills (Whitton, 2011).

The game-based student response systems (GSRSs), which are at the center of educational games, are gamification approaches that use student response systems and game principles to support learning, participation in learning, motivation and entertainment throughout the learning process (Bawa, 2019; Plump and LaRosa 2017). With the increasing use of GBL in education, interest in GSRSs like Kahoot!, Socrative, and Quizz is also increasing. GSRSs enable participants to activate their former knowledge and notice their own current knowledge status while learning the subject content and playing games (Bawa, 2019; Plump and LaRosa 2017). GSRSs bring students' interest, motivation, participation, and enjoyment in the lesson further and beyond traditional methods (Sarkar, Ford & Manzo, 2017; Wang and Lieberoth 2016). Since students can use GSRSs from their own mobile devices, this situation can also improve autonomy in learning. It also improves the interaction of students with each other and with their teachers by developing positive classroom dynamics (Hung, 2017). Another positive feature of GSRSs is that they increase participation in the lesson and motivate students who would not generally participate in classroom discussions (Wang, 2015; Wang, Zhu and Satere 2016). Students' participation in classroom discussion is very important for motivation and academic success, which strongly affects learning (Martin 2008; Pintrich and Schrauben 1992).

Kahoot!, one of the GSRSs, is a learning tool that works via the internet and allows the use of smartphones, tablets, and computers instead of complex controls and software (Kahoot!, 2020). Students can participate in the game as individuals or a group by answering the questions reflected on the screen with the help of their own mobile devices (Kahoot!, 2020). Several studies found that Kahoot! increases the internal and external motivation of the students (Tan Ai Lin, Ganapathy, Manjet, 2018), to be an effective assessment tool (Ismail & Mohammed, 2017), to be motivating, facilitating and entertaining application that ensures the maintenance of attention during the lesson (Cameron & Bizo, 2019). But, there are limited studies conducted on game-based learning in nursing. Özaras-Öz and Ordu (2021) reviewed the effects of Kahoot usage on improving nursing students' intramuscular injection knowledge and skills. They found that Kahoot! is a competent and useful tool in terms of motivating and supporting learning activities/processes.

Lack of motivation is one of the main barriers to learner success and performance (Hamid & Singaram, 2016). The high level of motivation of students for learning enables them to apply and maintain learning behaviors that enable learning to take place at the highest level (Bonanami, Olivari, Mascheroni, Gatti & Confalonieri, 2018). Learning strategies are techniques facilitating the self-learning of the individual. They aim to enable the learner to learn easily and permanently, increase the efficiency in learning, and give the learner the competence of independent learning (Büyüköztürk et al., 2004).

COVID-19 has affected nursing education as well as affecting all education systems. Different learning strategies such as online learning and blended learning instead of face-to-face education were adopted to provide effective education to nursing students during the pandemic. This transition increased the need for distance learning tools and distance assessment tools and to showed the importance of being prepared for future crises like COVID-19 in nursing education. The purpose of this research was to assess the effect of game-based learning on nursing students' motivation and learning strategies in occupational health nursing courses.

## METHOD

In this research, a quasi-experimental research design that was with a pretest and posttest design without a control group was used. Nursing students who had enrolled in an Occupational Health Nursing course as the potential participants were targeted in this study. Seventy-four nursing students enrolled in

the Occupational Health Nursing course in the fall of 2019-2020. Purposive sampling was used to select nursing students in this study. Sampling inclusion criteria:

- Enrolment in Occupational Health Nursing course in 2019-2020 academic year
- Not taking the Occupational Health Nursing course before
- Voluntary participation in this research.

The exclusion criteria were as follows (1) nursing students who took the Occupational Health Nursing course, (2) nursing students who did not volunteer to participate in the study. Before the first teaching session, the researcher explained the purpose and procedure of the study and invited nursing students to this study. All participants were notified by the researcher that participation in the study was voluntary and would not affect their grades. The sample of the study consists of 74 students who chose the Occupational Health Nursing elective course, not taken this course before and agreed to participate in the study. This research was conducted in a Nursing Faculty in Turkey between November 2019 – January 2020.

Data was collected with the sociodemographic characteristics questionnaire and motivated strategies for learning questionnaire (MSLQ) in this research. Socio-Demographic Characteristics Questionnaire consisted of questions including age, and gender. MSLQ measures Self-Regulated Learning and is based on social cognitive learning theory. MSLQ was developed by Pintrich, Smith, Garcia ve McKeachie (1991). The MSLQ was a seven point Likert scale composed of two scales, namely the Motivational Scales (MS) and the Learning Strategies Scales (LSS). MS consists of 31 items and six subscales (intrinsic goal orientation, extrinsic goal orientation, task value, control of learning beliefs, self-efficacy for learning and performance, and test anxiety). LSS consists of 50 items and nine subscales (rehearsal, elaboration, organization, peer learning, critical thinking, metacognitive self-regulation, time and study environment, effort regulation, and help seeking). Cronbach's alpha coefficients for the MS and LSS ranged from 0.68-0.80 and 0.52-0.80, respectively. Büyüköztürk et al. (2004) conducted validity and reliability study of Turkish MSLQ. Cronbach's alpha coefficients for the MS and LSS were 0.57- 0.82, and 0.53-0.79, respectively.

In this study, Kahoot! was used as a GBL tool. Kahoot! is one of the Web 2.0 tools where users with a certain level of computer literacy can produce and share content without having to know computer markup languages. In the Kahoot! application, participants can compete as individuals or a team and solve questions online. The questions are prepared by the researchers by logging in at https://kahoot.com/. The system automatically generates pin code for each quiz. Users log in to the system using the pin code through themselves smartphones or laptops. Kahoot! is a digital education platform where it is important to answer questions quickly as well as to answer correctly. Even if the number of correct answers is the same, those who answer the questions faster get more points according to others. In addition, after the Kahoot, an excel file is created by the system that shows who answered which questions (Kahoot!, 2020).

The intervention was carried out within the context of the Occupational Health Nursing elective course which is in the 5th term of the nursing faculty curriculum. Two Kahoot! Sessions were made during the course. Students participated in the first Kahoot! session individually, and in the second as a team. Before the Kahoot!, "Socio-Demographic Characteristics Questionnaire and MSLQ" were applied to all students in the study. After the pretests, the first Kahoot! session which participated students as individuals has been carried out. It consisted of multiple-choice 20 questions prepared by researcher. Four weeks later, the second Kahoot! session was carried out in which the students participated in groups of four or five. Each of the Kahoot! sessions consisted of multiple-choice 20 questions prepared by researchers. Four weeks after the second Kahoot! session, posttests were applied to all students.

IBM SPSS (Statistical Package for the Social Sciences) software (version 20) was used for data analysis. Kolmogorov–Smirnov test was used to evaluate the normal distribution of data. The paired sample t-test or Wilcoxon test was used to compare mean scores of the MSLQ subscale at the pretest and posttest. Wilcoxon test instead of paired sample t-test was used when the data were not normally distributed. A p-value of $<0.05$ was considered significant.

In order to carry out the study, permission was obtained from the Institutional Review Board (Approval Number:447). Written informed consent was obtained from the students who agreed to participate in the study.

## RESULT

The mean age of nursing students is 21.45±0.62. 85.1% of them (n=63) are women and 14.9% of them (n=11) are men. There were statistically significant differences between the pretest and posttest MS subscale scores of nursing students ($p<0.05$, Table 1). Nursing students had a significantly higher mean score in intrinsic goal orientation, control of learning beliefs, self-efficacy for learning and performance subscale, and to be a significantly lower mean score in the test anxiety subscale at the posttest compared to the pretest ($p<0.05$). There were no significant differences between pretest and posttest extrinsic goal orientation, and task value subscale mean score ($p>0.05$).

**Table 1. Comparison of Mean Scores Obtained From Motivation Scale by the Nursing Students (n=74)**

| | **Nursing Students M±SD** | **t/Z[a]** | **P*** |
|---|---|---|---|
| **Intrinsic Goal Orientation** | | | |
| Pretest | 4.86±1.02 | -5.72 | **0.01*** |
| Posttest | 5.15±0.75 | | |
| **Extrinsic Goal Orientation** | | | |
| Pretest | 4.87±0.90 | -1.80[a] | 0.07 |
| Posttest | 4.79±0.70 | | |
| **Task Value** | | | |
| Pretest | 4.65±0.80 | -0.35 | 0.73 |
| Posttest | 4.67±0.61 | | |
| **Control of Learning Beliefs** | | | |
| Pretest | 5.07±0.65 | -4.24 | **0.01*** |
| Posttest | 5.21±0.63 | | |
| **Self-Efficacy for Learning and Performance** | | | |
| Pretest | 4.55±0.66 | -4.15 | **0.01*** |
| Posttest | 4.98±0.63 | | |
| **Test Anxiety** | | | |
| Pretest | 4.88±0.98 | 9.33 | **0.01*** |
| Posttest | 3.99±0.63 | | |

M:Mean; SD:Standard deviation; t: t test; Z: Wilcoxon test
*$p<0.05$

There were statistically significant differences between the pretest and posttest LSS subscale scores, nursing students obtained higher mean scores from critical thinking, help-seeking, peer learning, metacognitive self-regulation subscales at the posttest. ($p<0.05$, Table 2). There were no significant differences between pretest and posttest rehearsal, organization, elaboration, effort regulation, time and study environment management subscale mean score ($p>0.05$).

**Table 2. Comparison of Mean Scores Obtained From Learning Strategy Scale by the Nursing Students (n=74)**

| | Nursing Students M±Sd | t/Z[a] | P* |
|---|---|---|---|
| **Rehearsal** | | | |
| Pretest | 5.17±0.73 | 0.52 | 0.60 |
| Posttest | 5.14±0.58 | | |
| **Organization** | | | |
| Pretest | 4.90±0.87 | -1.53 | 0.13 |
| Posttest | 5.04±0.65 | | |
| **Elaboration** | | | |
| Pretest | 4.83±0.78 | -1.50 | 0.13 |
| Posttest | 4.89±0.58 | | |
| **Critical Thinking** | | | |
| Pretest | 4.54±0.78 | -5.93[a] | **0.01*** |
| Posttest | 4.98±0.58 | | |
| **Help-Seeking** | | | |
| Pretest | 3.97±0.82 | -9.75 | **0.01*** |
| Posttest | 4.68±0.62 | | |
| **Peer Learning** | | | |
| Pretest | 3.77±1.16 | -8.13 | **0.01*** |
| Posttest | 4.55±0.72 | | |
| **Metacognitive Self Regulation** | | | |
| Pretest | 4.55±0.66 | -2.46[a] | **0.01*** |
| Posttest | 4.63±0.46 | | |
| **Effort Regulation** | | | |
| Pretest | 4.66±0.71 | -1.80 | 0.85 |
| Posttest | 4.67±0.61 | | |
| **Time and Study Environment Management** | | | |
| Pretest | 4.48±0.70 | -1.46[a] | 0.14 |
| Posttest | 4.41±0.53 | | |

M:Mean; SD: Standard deviation; t: t test; Z: Wilcoxon test
*p<0.05

## DISCUSSION

This study assessed the effect of Kahoot!, which is one of the GSRSs on nursing students' motivation and learning strategies. GSRSs positively affect students' motivation, satisfaction and learning success (Davidson & Candy, 2016; Cameron & Bizo, 2019). Control of learning beliefs mentions the belief that students can perform a task, while self-efficacy for learning and performance mentions students' beliefs about their own performance skills. In this study, It was found that nursing students had a significantly higher mean score in control of learning beliefs, self-efficacy for learning and performance subscale at the posttest compared to the pretest. The results of our study offer that Kahoot! provided to increase self-confidence and beliefs nursing students about being able to learn a lesson.

GSRSs improve participation in the lesson and allow even students who did not generally participate in classroom discussions to be motivated (Wang, 2015). Tan Ai Lin, Ganapathy, Manjet (2018) reported that

Kahoot! helps students increase their motivation intrinsically. Intrinsic goal orientation, which is expressed as one of the value components, focuses on learning, deep knowledge, and the reasons for students to participate in an academic task (Pintrich & Schrauben, 1992). Our study showed that the intrinsic goal orientation of nursing students was significantly higher in the posttest. This situation may be reasoned by Kahoot! contributes positively to students' deep learning.

Text anxiety expresses the excitement of the students during the assessments and the anxiety and concerns of the students about the exams (Pintrich & Schrauben, 1992). In this study, nursing students had a significantly lower mean score in the test anxiety subscale at the posttest compared to the pretest ($p<0.05$). This result shows that grade anxiety decreases due to the increase in students' belief and confidence that they can learn a course.

After the Kahoot!, students' posttest mean score of critical thinking, help seeking, peer learning, and metacognitive self-regulation subscales were found to be statistically significantly higher than the pretest. Critical thinking refers to the use of strategies to implement former knowledge to the new situation or to critically evaluate any thought. Gamification improves the effective learning environment by developing critical thinking in the classroom (Bicen and Kocakoyun 2017; Tewthanom, 2019) and increasing problem solving skills (Whitton, 2011). GSRSs also highlight the strengths of learners with different characteristics. Metacognitive self-regulation refers to strategies that help students plan their own activities, organize their own strategies, and control their own cognition. Similarly, to the findings of the present study, Nadeem & Al Falig (2020) found that Kahoot! has a positive effect in enhancing students' meta-cognitive skills.

Peer learning increases knowledge, understanding, cooperative learning, the development of critical thinking skills (Chojecki et al., 2010), enables students to learn more deeply with less stress, reduces anxiety when they make mistakes, and facilitates learning clinical skills (Ravanipour, Bahreini, & Ravanipour, 2015). It also contributes to the process of becoming a professional nurse by providing personal and professional development of nursing students (Abdullah, & Chan, 2018). Peer learning enables the development of cognitive and affective skills and the acquisition of technical skills (Abdullah, & Chan, 2018). GSRSs can also improve the group's commitment to each other as a result of peer collaboration and team interactions (Kinder, Kurz, 2018). Help-seeking is a strategy that can have an important influence on students' learning. The group session of Kahoot! is to engage students to help-seeking from each other in the group. In this way, students realize peer learning by getting help from each other. Our study results showed that Kahoot! enables positive effect development of peer learning and help seeking.

The strength of this study is to assess the impact of game-based learning in nursing education. There has been a limited study in the literature that assessed the effect of Kahoot on the motivation and learning strategies of nursing students. While this study contributed valuable findings to the literature, it did have some limitations. One of the most important limitations of this study is that because the Occupational Health Nursing course is an elective one, the majority of students had chosen this course voluntarily. Another limitation of this study is the small number of male students. Furthermore, the MSLQ is a self-reported questionnaire. This can lead to social desirability bias in respondents.

## CONCLUSION

As a result of this study, it was found that Game-Based Learning is a useful method to increase motivation and enhance the learning strategies of nursing students. Kahoot! made a positive contribution to motivation by increasing students' intrinsic goal orientation, control of learning beliefs, and self-efficacy for learning and performance. It has increased the use of critical thinking and meta-cognitive strategies, differently from learning strategies that students can use in classical learning systems. For this reason, from the first years of nursing education, the use of GSRSs such as Kahoot! will be useful in the development of learning in students' theoretical and practical education.

Kahoot! will be very useful in online education in present conditions (such as online education because of COVID-19 pandemic), as it provides instant feedback to educators and increases students' motivation about courses. The use of GSRSs in courses such as Occupational Health Nursing where students have limited practical training opportunities is even more important as it will increase students' interest and participation in the course.

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