

# Use of Digital Games for Educational Purposes Among Medical and Paramedical Sciences Students, Mashhad, Iran

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**Abstract.** This study aimed to investigate the use of digital games for educational purposes among medical and paramedical sciences students at Mashhad University of Medical Sciences (Northeast of Iran). This cross-sectional study was conducted from July 2018 to January 2019. The research population was all students of the school of medicine and school of paramedical sciences at Mashhad University of Medical Sciences (n = 496). The research tool was a researcher-made questionnaire based on a literature review. The validity of the questionnaire was confirmed by its content validity, and the reliability of the questionnaire was evaluated based on the test-retest method ( $r = 0.82$ ). In this examination of medical and paramedical sciences students' attitudes and perspectives, some novel preliminary insights into the applications, advantages, disadvantages, and features of digital games in education emerge. Overall, the findings showed that the use of interactive digital games can increase students' motivation for learning and make the learning process more attractive for students. This study was approved by the ethical committee of MUMS (approval number IR.MUMS.REC.1397.151).

**Keywords.** Digital game, medical education, gamification, e-learning

## 1. Introduction

A digital educational game for specific purposes of medical education is an electronic game that enables the interaction of professionals and students with a user interface in an offline and/or online mode reference. Digital games are developed for use on iPads, smartphones, computers, tablets, etc. Digital games lead to the strengthening of the attitude and motives of players towards learning through bolding the feeling of competition, using encouragements such as earning scores, and increasing the difficulty

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[1]. In addition, the game allows the player to quickly assess their progress with specific goals and immediate and reactive feedback [2]. Although extensive research has been conducted on the application of digital games in medical education, according to the researchers' knowledge, there are few studies that cover the attitude and use of digital games among medical students. Therefore, this study was conducted with the aim of investigating the use of digital games for educational purposes among medical and paramedical students at Mashhad University of Medical Sciences.

## **2. Methods**

This cross-sectional study was conducted from July 2018 to January 2019. The research population was all students of the school of medicine and the school of paramedical sciences at MUMS. Mashhad (in the northeast of Iran) is the second-largest city in Iran after Tehran. MUMS is one of the best medical universities in Iran, operating under the auspices of the Ministry of Health, Treatment, and Medical Education in Mashhad. This research was confirmed by the ethical committee of MUMS (approval number IR.MUMS.REC.1397.151). This research was conducted using a researcher-made questionnaire and a literature review [10, 13-16]. The main components of the questionnaire include the time spent on playing digital games for educational purposes, the impact of using digital games on academic achievement, students' attitudes towards the application of digital games in education, students' attitudes towards the advantages and disadvantages of digital games, and students' attitudes about the features of digital games that were ideal for educational purposes. The validity of the questionnaire was approved by its content validity, and the questionnaire was examined by five faculty members (two medical informatics, two health information management specialists, and a social medicine specialist). The reliability of the questionnaire was evaluated based on the test-retest method ( $r = 0.82$ ). The questionnaire was offered on a voluntary and anonymous basis to 549 medical and paramedical sciences students. The sample size was determined based on the Cochran formula with a 95% confidence interval independently for each community (medical and paramedical sciences schools). A p-value of 0.05 was applied to determine the level of statistical significance. Data were analyzed in SPSS version 11 software using descriptive and analytical statistics.

## **3. Results**

The questionnaire was completed by 496 respondents, with a response rate of 90%. In this study, the majority of participants were female (76.2%) and single (79.8%), and the average age of students was  $22.62 \pm 2.81$  years old. The findings of our study show that among the tools used for digital games for educational purposes, mobile phones had the most use, with 75.7% in medical students and 66.7% among paramedics, and computers in the university had the lowest use, with 84.6% in medical students and game consoles with 73.1% among paramedical sciences students. However, there was no significant difference in the use of digital game tools between medical and paramedical students. The place of use of digital games at home or in the dormitory is the most popular among medical students (69.2%), and paramedical sciences students (60.2%) and the least popular among medical students (54.3% on the way) and paramedical sciences students (55.8%) in the classroom. There was a significant difference between the use of medical

and paramedical sciences students at the beginning of each game (P-value <0.001); most paramedics (44.2%) stated that they use less than ten minutes of digital games for educational purposes. Nevertheless, as they stated, the majority of medical students (36.0%) use digital games for more than ten minutes to an hour for educational purposes. Medical and paramedical sciences students chose digital games as their priorities for learning objectives and specialized educational activities (68.4% and 52.6%), increasing general information (38.9% and 37.8%), and recreation (30.8% and 62.2%). According to Table 1, regarding the effect of digital games on academic achievement, the majority of medical students (51.4%) and paramedics (45.4%) stated that the use of digital games leads to their academic achievement. The highest percentage of agreement with the use of digital games among students was about their use for educational purposes, so 58.7% of medical students (*strongly agree* and *agree*) and 59.8% of paramedical sciences students (*strongly agree* and *agree*) tended to use digital games for educational purposes. There was no significant relationship between gender and willingness to use digital games for educational purposes (P-value = 0.221). The majority of agreements regarding the benefits of digital games were about communicating with other game players while playing and helping to facilitate learning. 93.6% of medical students and 98.4% of paramedical sciences students agreed and strongly agreed with communicating with other players during the game. 60.8% of medical students (*strongly agree* and *agree*) and 54.2% of paramedical sciences students (*strongly agree* and *agree*) stated that the use of digital games can facilitate learning. Furthermore, 71.7% of medical students and 75.1% of paramedical sciences students agreed and strongly agreed that it should be different ways to earn points in the game. 63.2% of medical students and 69.1% of paramedical sciences students agreed and strongly agreed that there should be possible to play digital games with different tools.

**Table 1.** The most important students' attitudes about the application in education, advantages and disadvantages, and characteristics of educational digital games

The most important students' attitudes toward the use of digital games in education								
Questions	Schools	Strongly agree N (%)	Agree N (%)	Somewhat agree N (%)	Disagree N (%)	Strongly agree N (%)	Mean ± SD	P-value
I like to use digital games for educational purposes.	Medicine	75(30.4)	70(28.3)	67(27.1)	28(11.3)	7(2.8)	2.27±1.10	0.025
	Paramedical Sciences	81(32.5)	68(27.3)	66(26.5)	14(5.6)	20(8.0)	2.29±1.20	
The most important students' attitudes toward the advantages and disadvantages of digital games								
It is possible to communicate with other players during the game.	Medicine	138(55.9)	93(37.7)	9(3.6)	2(0.8)	5(2.0)	1.55± 0.78	0.033
	Paramedical Sciences	164(65.9)	81(32.5)	2(0.8)	1(0.4)	1(0.4)	1.36±0.56	
The use of digital games facilitates learning.	Medicine	74(30.0)	76(30.8)	70(28.3)	23(9.3)	4(1.6)	2.21±1.02	0.002
	Paramedical Sciences	43(17.3)	92(36.9)	81(32.5)	19(7.6)	14(5.6)	2.47±1.04	
The most important students' attitudes about the characteristics of educational digital games								
Ways to earn points should be optional for the individual.	Medicine	71(28.7)	107(43.3)	47(19.0)	19(7.7)	3(1.2)	2.09±0.94	0.027
	Paramedical Sciences	60(24.1)	100(40.2)	59(23.7)	15(6.0)	15(6.0)	2.29±1.08	
	Paramedical Sciences	78(31.3)	74(29.7)	68(27.3)	14(5.6)	15(6.0)	2.25±1.13	
	Medicine	83(33.6)	73(29.6)	50(20.2)	39(15.8)	2(0.8)	2.20±1.09	<0.001

It allows play and continue digital games with different types of tools (such as mobile phones, laptops, tablets, etc.).	Paramedical Sciences	94(37.8)	78(31.3)	54(21.7)	8(3.2)	15(6.0)	2.08±1.12
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## 4. Discussion

### 4.1. Principal Findings

According to the findings of the present research, the use of these digital educational games among students is mostly for teaching and learning purposes. In this study, most medical and paramedical sciences students stated that digital educational games could have a positive effect on their academic achievement. According to Noraddin et al. [3], most students stated that they tend to use digital educational games for learning purposes because they facilitate the learning of relevant courses. In line with the results of this study, Alastair et al. found that complementary medicine students have a high willingness and ability to use digital technologies as a learning stimulus [4]. We also found that among the tools used for digital games, students preferred to use mobile phones. Mobile-based educational games allow players to play whenever they want. Therefore, when the player has free time, s/he can use it optimally [5, 6]. The results of a comparative survey of the use of mobile-based games compared to other digital gaming tools showed that the majority (54%) of students prefer to play mobile-based games [7]. As shown in the findings of this study, most paramedical sciences students (44.2%) use less than ten minutes of digital games for educational purposes. In contrast, the majority of medical students (36.0%) stated that they use digital games for more than ten minutes of an hour for educational purposes. However, in general, the results of this study showed that students tend to play at different times with a duration of less than one hour. Sitzmann, in his meta-analysis study, found that, based on media comparisons, unlimited access to the game had much better learning outcomes than limited access to the game [8]. Wouters et al. focused on a combination of distance learning and one-time learning. As they explained, this result is plausible because, compared to traditional teaching methods, the effect of digital games on learning is only compensated for after a few practice sessions when the players become accustomed to the game [9]. We found that the majority of students considered the use of digital games as a means of academic achievement and recognized digital games as a tool to facilitate learning. As Fuster-Guilló et al. found, the majority of students reported a positive perception and attitude toward learning through digital games (56% believed that digital games enhanced their learning, and 48% stated that digital games motivated them to learn) [10]. Also in this study, 93.6% of medical students and 98.4% of paramedical sciences students expressed that they agreed and strongly agreed with communicating with other players during the game. Consistent with the results of our study, Kron et al. found that if digital games were multiplayer (97%) and helped to develop patient interaction skills (90%), they were more likely to use multiplayer and interactive digital games (simulators) [11]. Therefore, in the design of digital educational games, student participation increases probably the sense of competition, attraction, and thus better learning.

#### 4.2. Strengths and limitations

One of the strengths of our study was the high response rate of the participants to this survey (response rate of 90%); due to the careful follow-up for the correct response, it had a minimum of missed data. Moreover, we designed a questionnaire that can identify the maximum perceptions and views of students as the main users of digital games for optimal design and policy-making according to their needs. However, our study also had some potential limitations. First, this study Participants self-selected, and as such, this may have contributed to the selection bias. Second, this was a single-center study, which limits the generalizability of the results. Third, most of the participants in this study were young medical and paramedical science students. It is unclear how sufficient this kind of survey would be in an older population such as senior doctors. Despite these limitations, the results from this study provide valuable insights into medical and paramedical science students' perspectives and experiences regarding digital games. Thus, other students' perceptions of digital games in other institutions and universities require further investigation and comparison with these findings.

#### 5. Conclusions

The findings showed that the use of digital games can increase students' motivation for learning and make the learning process more attractive for students.

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