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RESEARCH ARTICLE

The effect of different gamification designs on pharmacy and pharmacy technician students

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Abstract

Background: Gamification, a method affecting student motivation, engagement, and success, is included in pharmacy education. In pharmacy education, gamification concepts are generally confused with game-based learning. This study sought the opinions of pharmacy and pharmacy technician students regarding two different gamification designs with various combinations of game elements. **Methods:** A total of 109 pharmacy and 49 pharmacy technician students were assigned to four groups according to a 2 × 2 factorial design. Two gamification designs were made according to the game elements they involved: (1) badges and points and (2) badges, points, and leaderboard. Data were collected through a survey and focus group interviews to explore students' opinions about the elements. **Results:** Of the 129 students who responded to the survey, seven participated in the focus group. Statistically significant differences were observed in terms of entertainment and ambition, while no significant differences were found between the groups regarding motivation. The leaderboard appeared to entertain pharmacy technician students more than pharmacy students. Additionally, two themes, "*game elements*" and "*gamification effect*," emerged from the focus group. **Conclusion:** The differences between the groups regarding game elements and educational areas highlight the need to determine suitable game elements for effective gamified learning environments.

Introduction

Gamification, or the use of game elements, is becoming increasingly widespread in learning environments. From an educational perspective, gamification can be defined as an instructional approach that increases motivation by using game elements in the learning-teaching process. Studies have shown that gamification has a positive effect on attitude, motivation, engagement, and achievement and has the potential to improve learning (Ahmed *et al.,* 2017; Mekler *et al.,* 2017; Aşıksoy, 2018; Kyewski & Krämer, 2018; Antonaci *et al.,* 2019; Morris *et al.,* 2019; Fijačko *et al.,* 2020).

When educational gamification studies are examined, it can be observed that game elements are combined into different settings in gamification design. The most commonly used elements are points, badges, and leaderboards (Subhash & Cudney, 2018), while their elements and combinations are among the most frequently used in gamification designs (Aşıksoy, 2018; Huang & Hew, 2015). Frequency sorting in combination includes badges, leaderboards, levels, badges, points, and settings with only points (Bai *et al.,* 2020). When considering pharmacy education studies, points and leaderboards are used as elements (Dell & Chudow, 2019; Jones & Wisniewski, 2019). When only the leaderboard-reward mechanism was used in a gamified mobile application, some students emphasised the competitiveness of this ranking (Jones & Wisniewski, 2019). Although some studies have sequenced the usage of game elements, gaps remain in the effectiveness of game elements and their combinations (Hookham *et al.,* 2015; Hanus & Fox, 2015; Meşe & Dursun, 2018; Leitão *et al.,* 2022).

Various studies have focused on the gamification of healthcare professionals' education (Gentry *et al.,* 2019; Fijačko *et al.,* 2020; Alshammari, 2020; Jiménez-Sánchez *et al.,* 2020). While gamification is more

common in medical and nursing education, it is less frequently used in pharmacy education (Cain & Piascik, 2015; Lee *et al.,* 2018). Although the American Association of Colleges of Pharmacy Academic Affairs Committee recommends gamification to educate students as future healthcare leaders using innovative techniques (Cain *et al.,* 2014), game-based studies have mainly been conducted since the mid-1990s in pharmacy education. Some of those studies were based on popular game settings like "*Who Wants to Be a Millionaire*" as "*Med Chem Millionaire*" or crossword puzzles (Roche *et al.,* 2004; Patel, 2008; Shah *et al.,* 2010; Chavez *et al.,* 2012).

Game-based learning studies in pharmacy education have resulted in increased student awareness, confidence, skills, enjoyment, engagement, and motivation (Oliver *et al.,* 1995; Patel, 2008; Barclay *et al.,* 2011; Rose, 2011; Sando *et al.,* 2013; Hookham *et al.,* 2015; Sera & Wheeler, 2017; Lee *et al.,* 2018; Truong *et al.,* 2019; Whitman *et al.,* 2019; Dabbous *et al.,* 2023). While one review emphasised the positive effects of game-based practices in pharmacy education, it also raised the need for more concrete evidence (Aburahma & Mohamed, 2015). In addition, there are limited studies on gamification in pharmacy technicians' education (Fogarty, 2019). In game-based learning, a game is embedded in a learning environment to achieve learning outcomes. However, gamification involves no game but only game components used in non-game environments (Dahalan *et al.,* 2024). Hence, these two concepts can be confusing in pharmacy studies.

A literature review of gamification in pharmacy education revealed that gamification could highly benefit students (Shawaqfeh, 2015; Hope *et al.,* 2023a). The limited gamification studies conducted in various courses, such as pharmacotherapy, pharmacology, and healthcare communication, have demonstrated the potential of gamification (Shawaqfeh, 2015; Dell & Chudow, 2019; Lam *et al.,* 2019). Gamification has also been included in simulation applications for patient encounters and counselling, which are integral to the pharmacy profession (Hope *et al.,* 2023b). For instance, a design where students could provide patient encounters in a virtual environment was developed, and student feedback indicated a positive contribution to learning (Yap *et al.,* 2020). These studies were identified through keyword searches for "*gamification*" and "*pharmacy education*." Importantly, gamification concepts are often confused with game-based learning, and the number of gamification studies in pharmacy education remains relatively low. Many existing examples utilise only competition game elements. Therefore, it is necessary to focus on gamification design and carefully select game elements based on the primary and secondary aims of the educational intervention to maximise the potential benefits of gamification (Hope *et al.,* 2023a).

From this point of view, and to develop appropriate gamification for groups, it was essential to explore the opinions of pharmacy students and pharmacy technician students on various game elements and examine whether their evaluations differ, considering the differences in their educational levels.

This study aimed to understand the opinions of participants who will work in the same sector but have different educational levels on gamification designs, including game elements and dynamics.

Methods

Design

This experimental study gamified a 4-week simulation practice involving standardised patient encounters to improve the communication skills of pharmacy and pharmacy technician students. It employed a 2×2 factorial design to examine the effects of three main elements: points, badges, and leaderboards. This design was chosen due to time constraints, the study's scope, and the number and diversity of participants, allowing for more consistent and comparable data and explicit analysis of the relationships between variables. Table I and Figure 1 present a summary of the research design.

Table I: Research model

Students' department	Gamification design	
	I: Points and Badges	**II: Points, Badges, and Leaderboard**
Pharmacy students	Group 1 (P1): N=57	Group 2 (P2): N=52
Pharmacy technician students	Group 3 (PT1): N=25	Group 4 (PT2): N=24

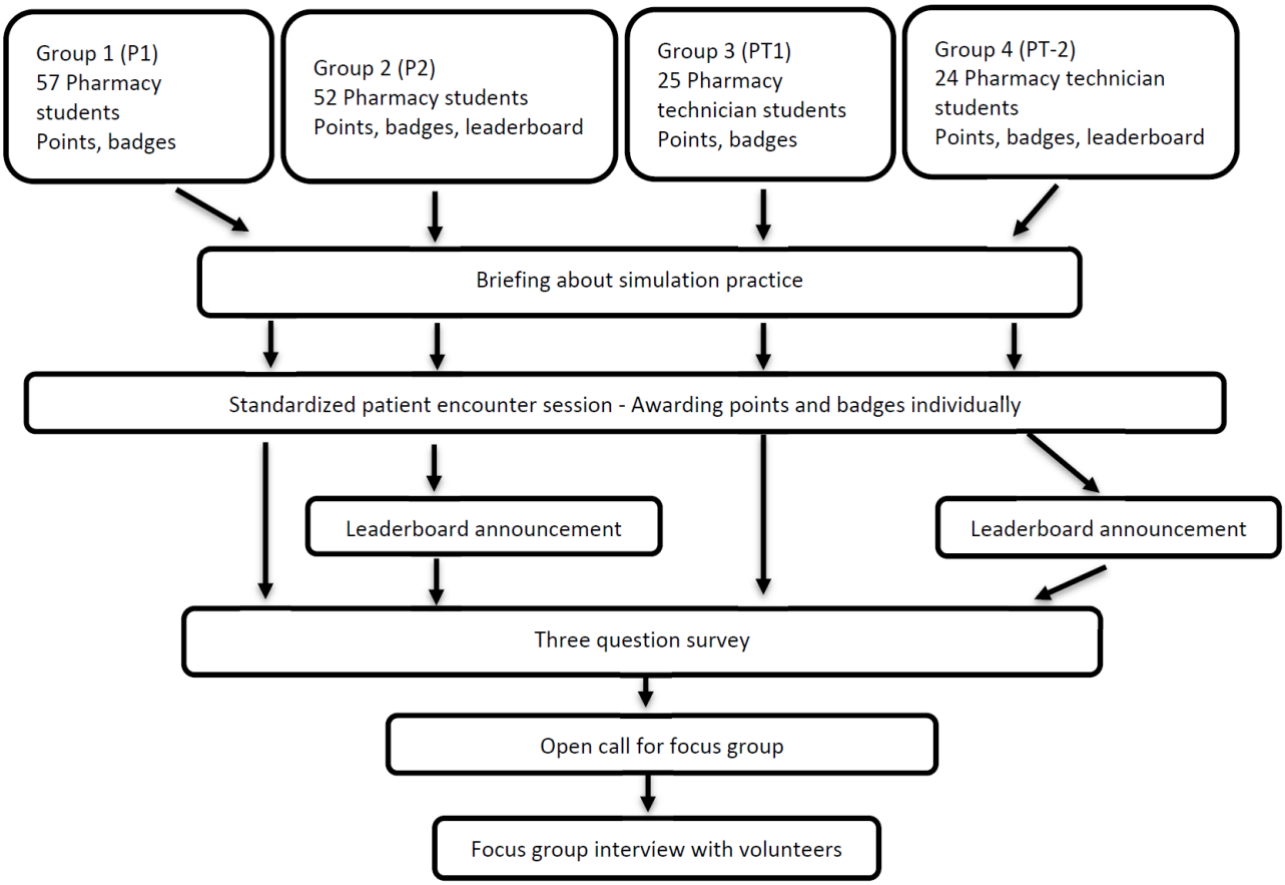

Figure 1: Research process

Participants and gamification design

Standardised patient encounters were conducted in two compulsory courses to improve the communication skills of second-grade pharmacy students (109 students) and second-grade pharmacy technicians (49 students) at the same university. Both groups were further divided into two groups according to gamification settings. Students were randomly assigned to groups within their respective departments. All groups participated in the simulation activities, following the same flow.

Two distinct gamification designs were implemented to determine the effects of different game element combinations: (1) badges and points and (2) badges, points, and a leaderboard. The groups from each department were assigned one of these gamification designs.

Instructions regarding gamified standardised patient encounter processes were given to each group, and the groups attended practice sessions at different times. After participating in the simulation, all 158 students received a profile card showing their earned points and badges.

In this context, a profile card was prepared with three main headings: non-verbal communication, verbal communication, and patient encounter, weighted at 25, 25, and 50 points, respectively. Students could earn badges in each section (Table II). They were informed that to earn their respective badges, they needed to score at least 20 points in the first section, 20 points in the second section, and 45 points in the third section. Additionally, students could earn a mortar badge by achieving 90 points. Leaderboards were shared separately with P2 and PT2.

Table II: Gamification elements used in standardised patient encounters

Game element	Description
Points	Students received points based on their communication skills during the standardised patient encounter.
Badges*	 Non-verbal communication badges were given to the students who got 20 points at least in this section.  Verbal communication badges were given to the students with 20 points at least in this section.  Patient encounter badges were given to the students with 45 points at least from this section.  Mortar badges was given to students who scored 90 or higher across all sections.
Leaderboard	The top three students who had the highest scores from the groups P2 and PT2 were announced to their group at the end of the simulation day.

*Badges were designed using resources from https://www.freepik.com/

Data collection tools and data analysis

Within the scope of this study, quantitative and qualitative data were collected to determine student evaluations of gamification. According to established standards, at least 80% participation in the survey is considered adequate (Fincham 2008; Draugalis & Plaza 2009). In this study, 82% of the students participated in the data collection.

Quantitative data

The researchers developed a survey to determine students' levels of entertainment, motivation, and ambition. A three-question survey with a 5-point scale was administered immediately after the standardised patient encounters to gather students' opinions on the gamification elements. The survey link was sent via e-mail, and responses were received anonymously. Participation in the survey was voluntary. The first question asked students to evaluate their enjoyment, the second assessed their motivation, and the third evaluated their ambition, with responses scored from 1 to 5.

To analyse differences between groups based on the survey results, the Mann-Whitney U test, a non-parametric test, was conducted at a 5% significance level ($p < 0.05$). Statistical analysis was performed using IBM SPSS version 23.

Qualitative data

For the qualitative part of the study, a focus group interview was conducted according to the Consolidated Criteria for Reporting Qualitative Research (COREQ) (Tong *et al.,* 2007). After all groups completed the standardised patient encounters, an open call was made for focus group participation. A female pharmacist researcher with a PhD degree conducted the interviews at the Faculty of Pharmacy. Only five pharmacy students and two pharmacy technician students volunteered to participate.

Participants were informed of the aim of the interview. Students from the P1 group were named P1_S1, P1_S2, and P1_S3, those from the P2 group as P2_S1, P2_S2, and students from the PT1 and PT2 groups as PT1_S1 and PT2_S1, respectively. The interview focused on two main questions to gather students' opinions regarding gamification: "*What do you think about the game elements that are used in the course*?" and "*How do you think gamification affected your learning process*?" The interview was audiotaped and lasted approximately 70 minutes.

In the qualitative part, the transcripts were analysed and codes were checked by two researchers to ensure trustworthiness. Students' opinions were categorised according to thematic analysis. The codes and themes that emerged from the focus group interview transcriptions were analysed using Atlas.ti.

Results

Results from three-question survey

A total of 129 students completed the questionnaires assessing entertainment, motivation, and ambition, with an overall participation rate of 82% (82% among both pharmacy students and pharmacy technicians). As shown in Table III, statistically significant differences were found in entertainment and ambition levels.

Group P1 pharmacy students (points and badges) had significantly higher mean ranks for entertainment compared to group P2 (points, badges, and a leaderboard) and group PT2 (points, badges, and a leaderboard). Additionally, group PT2 had a significantly higher mean rank for ambition compared to group P2. No significant differences were found between the groups regarding motivation.

Table III: Differences between groups in terms of three-question survey

		P1	PT1	P2	PT2	P1	P2	PT1	PT2
	n	**45**	**20**	**44**	**20**	**45**	**44**	**20**	**20**
Entertainment	Mean rank	32.51	34.10	28.48	41.35	52.00	37.84	19.50	21.50
	p-value	0.738		0.008*		0.007*		0.602	
Motivation	Mean rank	32.82	33.40	30.02	37.95	48.19	41.74	19.65	21.35
	p-value	0.901		0.091		0.207		0.659	
Ambition	Mean rank	30.68	38.23	27.95	42.50	48.33	41.59	20.25	20.75
	p-value	0.119		0.002*		0.195		0.904	

*Significant *p*-value

Themes and codes from the focus group interview

Feedback on the gamified implementation was gathered from seven volunteer students through the focus group. Analysis revealed eight codes grouped into two main themes: game elements and the effect of gamification. The themes, codes, student opinions, and selected quotes are presented below.

• *Game elements*

Four codes (points, badges, leaderboards, and rewards) were derived from the focus group participants' opinions of the game elements.

Students felt that points clarified tasks and success criteria and guided them to complete assignments adequately. Some students even suggested adding more tasks and subtasks related to points for more precise guidance. They also viewed points as a monitoring tool, with two students noting that points increased their self-confidence and motivated them.

> *"I was more careful in the process because I would get points. I had already studied, considering the criteria in the scoring. In fact, as my friend said, it seemed to me that if the criteria were more, it would be better for us. Then it would be more guiding." (P1_S2)*

> *"The points were already good; it was enough. In fact, it was nice in a way that we got points and saw our failures. It made me realise my mistakes and guided me on which subject I should improve myself." (PT1_S1)*

> *"(In the gamified implementation) I felt like I was monitoring myself. Normally, I never thought of being a community pharmacist, but when I saw my points, I realised that I could do it. In this respect, the points affected me positively." (P1_S2)*

However, two students perceived points negatively, finding them meaningless and akin to being in an exam setting. Hence, one student suggested using descriptive words instead of points to evaluate performance.

> *"Our performance was somewhat negatively affected as we focused on the score." (PT2_S1)*

"If the main purpose is to improve ourselves, why should we tie it to numerical data?" (P1_S3)

"I think when people see that they get scores like 100-95-90, it starts to turn into another compulsory course exam. It might be better if you say "sufficient", "needs to be improved", etc." (P1_S2)

While most students were either positive or neutral about the badges, one student criticised their design. Another student suggested making badges more visible by producing a physical version that could be pinned to clothes, for example.

"I was happy when you gave me that board with badges after the standardised patient encounter." (P1_S3)

"Can I say something about badges? A little discouraging, I believe. It seems a little childish to me, such illustrations." (P1_S1)

"If the badges were a little more visible, in a way that people could actually carry, (that would be better)" (P2_S2)

It was noted that students listed on the leaderboard felt motivated and might study more to improve their ranking. Students reached a consensus that displaying only the top three was a suitable choice, as a full list could be demotivating for those ranked lower. One student even suggested making participation in the leaderboard optional.

"It's good that our friends got the statue they deserve. Thanks to their good performance, they got into the rankings." (PT2_S1)

"At least it is motivating for the first three. There are not many ambitious people among us [participants of the focus group] at the moment, but some of our friends could have been motivated [by the leaderboard] to enter the top three, even if we are not motivated at this point. I think the person who knows that it exists and will be motivated for it later is in the classroom too." (P1_S1)

"From my point of view, it's nice to have only the first three. If there were others, even if the worst had seen themselves, this time they would have felt bad and pressured. So it's good to have only the first three." (P2_S2)

"How about we do it like a tournament? Let's just let people inform the instructor about competing for the leaderboard by saying "I am a candidate to compete on the leaderboard". Those who are not a part of the competition won't be listed on the leaderboard whether they got a high or low point. There is a competitive environment; instead of making it mandatory for everyone, let's have a competition for who wants to join." (P1_S3)

While six students appreciated the leaderboard, one student expressed concerns about the leaderboard's competitiveness.

"There is a ranking like 1, 2, 3. I wouldn't like to be compared with the people in my own group." (P1_S1)

Students in the focus group also viewed their points, badges, and leaderboard rankings as rewards. They reached a consensus that it would be better to use concrete rewards in addition to virtual ones. Examples of expected rewards included chocolates or a meeting with the dean, with one student highlighting that rewards should be something not easily attainable. Various other suggestions for rewards were also made.

"Concrete rewards are needed. People would be very motivated if full points were rewarded." (P2_S2).

"For example, if we have a meeting with the dean. If you provide a reward that we cannot normally have, that motivates me." (P2_S1)

• *Gamification effect*

Students' feedback during the focus group revealed concrete insights into gamification effects regarding social interaction, self-confidence, motivation, and entertainment.

All students reported that gamification enhanced their social interactions with classmates.

"People with whom I normally do not communicate much or who do not prefer to talk to me started to ask questions about the implementation. We started to discuss our performances and badges. When we started to talk once, it kept going. After the course, we greeted each other and smiled more often." (P1_S1)

"It was nice to share this with others, not only when I got a badge, but also when I didn't. You comfort each other." (P1_S3)

According to students, gamified standardised patient encounter practices increased their self-confidence.

"I was very excited as I was looking at myself. It meant I'm not that bad, so it motivated me as if I could do it." (P1_S2)

All participants agreed that gamified implementation increased their motivation, except for one student, who expressed a contrary opinion due to the high volume of tasks in a limited timeframe.

"Having these [game elements] is good for motivation." (P2_S1)

"We do a lot of work in a short time; it reduces my motivation." (P1_S3)

Most students found the experience entertaining, while the student who reported decreased motivation remained neutral on this aspect.

"I had fun." (P1_S1)

"I was nervous but had fun." (P2_S2)

Overall, the students' opinions predominantly highlighted positive feedback on gamification as an educational tool.

Discussion

Gamification is becoming increasingly prevalent across various environments, from professional settings to daily life. Its positive contributions have made it particularly popular in higher education. Like other industries, the pharmacy sector has also embraced gamification practices (Marcão *et al.,* 2020). One of the primary benefits of gamification is its ability to provide realistic environments through simulations (Arkün Kocadere & Samur, 2016). However, the number of gamification studies in pharmacy education remains notably low, with most of the existing research focusing on game-based learning cases. This study addressed this gap by applying a gamification design that integrated points, badges, and leaderboards into the learning environment.

This study explored the differences in groups' views on game dynamics and the varying effects of game elements, particularly the leaderboard, on these dynamics. It also examined the opinions of groups with different educational levels regarding the elements and dynamics involved in game design. In particular, the leaderboard had disparate effects on participants at associate and undergraduate levels in terms of ambition and entertainment.

The 3-question survey results revealed significant differences between groups regarding the gamification effect, particularly in relation to the leaderboard. Pharmacy technician students in the leaderboard group reported higher levels of entertainment and ambition compared with pharmacy students. These disparate results echo the conflicting findings in the literature on leaderboard use. While one study highlighted the leaderboard's contribution to competition and participant encouragement (Wang *et al.,* 2024), others noted the lack of robust findings on leaderboards (Dichev & Dicheva, 2017) and the need to examine the effects of different game elements on various groups (Balci *et al.,* 2022). Interestingly, the current literature lacks studies exploring the reasons behind these disparities among occupational groups.

While the survey results revealed that gamification did not yield any statistically significant difference between groups in terms of motivation, the focus group discussions provided nuanced insights. Some students reported that the leaderboard was motivating for those in the top three positions, but others believed that it could negatively affect those in lower ranks if all rankings were displayed. This observation aligns with other findings (Arkün Kocadere & Çağlar, 2015). While some students expressed negative opinions about the leaderboard's role in increasing competition, most of them perceived it as encouraging success, aligning with previous conclusions (Whitman *et al.,* 2019).

The effect of points on self-confidence, as expressed by students in the qualitative findings, aligns with different gamification practices in pharmacy education (Hope *et al.,* 2021). Additionally, students' suggestions regarding reward and level elements in the qualitative results are compatible with the gamification design. In this context, a specific motivational classification can be used to increase motivation while using gamification (Morris *et al.,* 2019).

Social interaction and collaboration were closely related dynamics of gamification, both of which were notably emphasised in this focus group's findings. Previous research has demonstrated that gamification can improve social interaction (Sailer & Homner, 2020), as also observed in pharmacy education gamification designs focused on technical skills (da Silva Júnior *et al.,* 2022). Similarly, the focus group participants in this study reported that gamification elements, such as badges and points, increased interaction during a soft skill-based education process. Gamification's potential to foster collaboration is particularly crucial in the training of healthcare workers.

All focus group participants reported enjoying gamification, but the quantitative data revealed that pharmacy technician students in the leaderboard group showed higher levels of entertainment than pharmacy students in the same group. Additionally, pharmacy technician students in the score-badge group found the experience more entertaining than those in the leaderboard group. These findings echo the results of a previous study showing varying levels of entertainment among students (Arkün Kocadere & Çağlar, 2015).

Limitations

This study was constrained by time limitations, with each student participating in only one standardised patient encounter session. Research has demonstrated that gamification interventions lasting one to six months have much greater effects on motivational learning outcomes than those lasting two days or less (Sailer & Homner, 2020). Consequently, it is thought that extending the study's duration would have had a higher impact on motivational learning outcomes. Moreover, the limited timeframe necessitated that students undertake and conclude three different tasks simultaneously within the limited educational term. Separating these tasks could also have improved student motivation and engagement.

Another limitation arose from the difference in enrolment numbers across different programmes, resulting in uneven participant distribution for each profession. Furthermore, this study was restricted to evaluating a limited number of game dynamics, including only three game elements, while also determining the opinions of groups with diverse characteristics. Nevertheless, the number of groups was limited to ensure an appropriate number of participants and to maintain statistical validity. In line with the study's objective, participants were asked about their evaluations of only three dynamics. More comprehensive studies with a larger sample size and a higher number of dynamics should be conducted to address these limitations.

Conclusion

In conclusion, this study reveals that the effectiveness of game elements differs significantly between pharmacy and pharmacy technician education. Notably, pharmacy technician students in the leaderboard group demonstrated higher levels of enjoyment and ambition compared to pharmacy students. These findings underscore the importance of tailoring gamification designs to specific educational contexts and student groups.

Future research should explore a broader range of game dynamics and elements across various health fields, including pharmacy and pharmacy technician education. This expanded scope will contribute to developing more effective, context-specific gamification strategies. Implementing appropriately designed gamification elements, such as levels, points, and rewards tailored to pharmaceutical care processes, would help enhance student engagement, improve learning outcomes, and foster better interaction between different professional groups in healthcare education.

Ethics approval

The Hacettepe University Ethics Commission approved the research design from ethical review (E-35853172-300-00002336218). All participants gave informed consent before taking part.

Conflict of interest

The authors declare no conflict of interest.

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