

Research Article

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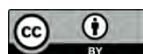
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Game-Based Learning: Alternative Approaches to Teaching and Learning Strategies in Health Sciences Education

Zijing Hu 

Abstract

Background/purpose. Game-based learning has received increased attention in health sciences education in the global north due to its effectiveness in achieving learning outcomes. The literature concurs that learning outcomes can be improved through appropriate pedagogical approaches. However, more studies need to focus on game-based learning in the health sciences and higher education field in South Africa. This study aimed to explore acupuncture students' lived experiences with game-based learning at an identified South African university.

Materials/methods. The research was grounded within the interpretivist paradigm, employing a qualitative approach, adopting a single-case study design.

Results. The findings of this study revealed that game-based learning positively promoted students' learning experiences and their curriculum outcomes. However, the participants highlighted a few challenges, including a lack of feedback sessions, large student numbers but insufficient facilitators, and an absence of digital games in their university programs.

Conclusion. Game-based learning is associated with multiple advantages, including essential skills in the working world. These skills include teamwork, communication, and self-reflection. Although game-based learning is a practical approach to improving learning outcomes in health sciences education, there are still areas that need to be enhanced in order to promote its successful use. Future research can be conducted using different research designs.

1. Introduction

Game-based learning has emerged as a dynamic pedagogical approach that encourages and enhances students' learning through games. Games that are engaging and interactive in nature have been found to impart knowledge and enhance skills. Gamification refers to incorporating game-like elements into teaching and learning. In contrast, game-based learning incorporates actual games into the learning experience and has received attention for its potential to transform education, particularly in health sciences (Hashim et al., 2019; Jääskä & Aaltonen, 2022). This educational methodology, rooted in the principles of social constructivism, aligns with the idea that students actively construct their understanding through experiences and social interactions (Mee et al., 2020; Vygotsky, 1962). Game-based learning in Higher Education Institutions (HEIs) plays a significant role in engaging students, promoting learning outcomes, and enriching overall learning experiences (Akour et al., 2020; Yaccob et al., 2022). Collaborative interactions between students and games and interactions among students and instructors are integral components of this approach (Jääskä & Aaltonen, 2022). While game-based learning is versatile and can encompass various enjoyable and exciting activities to improve learning outcomes, its implementation in health sciences education is not without challenges. There is a lack of research focusing on game-based learning to promote learning outcomes in the health sciences at HEIs in South Africa. Therefore, this paper explored students' game-based learning experiences in health sciences education at a South African HEI, posing the question, "What are the challenges in implementing game-based learning in health sciences education in South Africa?"

Furthermore, this study delves into the barriers hindering the effective implementation of game-based learning, particularly in South Africa. Technological, cultural, and institutional challenges pose significant obstacles, necessitating careful consideration and strategic interventions for successful adoption. The study was grounded within the theoretical framework of "social constructivism," drawn upon the foundational principles of Vygotsky and emphasized the importance of creating a constructive classroom environment. By investigating both the advantages and barriers associated with game-based learning in health sciences education, this research aimed to contribute valuable insights to educators, policymakers, and researchers seeking to leverage innovative pedagogical approaches in the ever-evolving landscape of higher education.

2. Literature Review

2.1. Values of game-based learning in health sciences education

Game-based learning is a pedagogical approach that utilizes games to teach and strengthen various knowledge and skills, distinguishing itself from gamification by incorporating actual games into the learning experience (Hashim et al., 2019). Balakrishna (2023) defined game-based learning as applying the rules of games to real-life settings in order to engage students, while Hashim et al. (2019) described it as a pedagogical approach with defined learning outcomes achieved through games. Game-based learning has gained popularity as it engages students, promotes learning outcomes, and enhances learning experiences (Mee et al., 2020; Subhash & Cudney, 2018). According to Jääskä and Aaltonen (2022), game-based learning involves collaborative interactions between students and games, students with students, and students with instructors, accompanied by meaningful feedback. Therefore, game-based learning fundamentally differs from gamification as it includes an actual game that creates a learning experience that teaches or reinforces knowledge and skills. It promotes the collaborative construction of knowledge achieved through learner-game, learner-learner, and learner-instructor interactions coupled with meaningful feedback (Jääskä & Aaltonen, 2022). Hashim et al. (2019) stated that game-based learning is a pedagogical approach with clearly defined learning outcomes through games.

Adipat et al. (2021) emphasized the application of digital games to facilitate learning outcomes. However, Balakrishna (2023) argued that games did not have to be digital; the crucial aspect being their ability to facilitate learning. Balakrishna (2023) stated that the most important distinguishing characteristic of game-based learning is that the games must facilitate learning so as to achieve learning outcomes. In the current study, games encompass a broader definition, including any enjoyable and exciting activities aimed at improving learning outcomes. Elements such as fun, teamwork, collaboration, and interaction contribute to the significant role of games in promoting learning at HEIs (Mee et al., 2020). Yaccob et al. (2022) further suggested that games require teamwork, collaboration and interaction, which are essential skills for the world of work in the 21st century. Game-based learning encourages learning through trial and error, aligning content knowledge with pre-designed rules and consequences (Adipat et al., 2021; Danniels & Pyle, 2018). In their work, Akour et al. (2020) and Yaccob et al. (2022) stated the advantages of using games in education, including their appeal to students, creating an attractive learning environment, reducing stress, and promoting teamwork. The motivational psychology in game-based learning allows students to interact with educational materials playfully and dynamically (Alomari et al., 2019). It involves designing learning activities that incrementally introduce concepts and guide users towards an end goal (Balakrishna, 2023).

Game-based learning enhances contextual understanding and thinking processes, effectively creating meaningful and engaging lessons (Yaccob et al., 2022). Rahmani (2020) reports benefits such as improved motivation, positive attitudes, cognitive achievements, and engagement in academic activities. Hashim et al. (2019) stressed the importance of planning and organizing game-based learning to effectively promote student motivation and highlight its alignment with student-centered learning (Mallick & Waheed, 2024). This view concurs with Adipat et al. (2021), who articulated the need to employ enjoyable academic activities that enhance interaction and teamwork at HEIs. Alomari et al. (2019) suggested that games can improve learning outcomes by enhancing student engagement in classes. Danniels and Pyle (2018) advocated for creating a positive learning environment for students, irrespective of age, and emphasized the consideration of the player's "zone of proximal development" (ZPD). However, caution is advised to avoid demotivating students due to their poor gaming performance (Welbers et al., 2019).

Adipat et al. (2021) articulated that game-based learning encourages students to learn through trial and error; achieved by arranging content knowledge with pre-designed rules and consequences. According to Danniels and Pyle (2018), rules are the key differential factors between games and non-rule-governed play. The author believes that appropriate games make learning more effective as they provide for student-centered learning. This view concurs with that expressed in the study of Yaccob et al. (2022), in which it was stated that games are a practical pedagogical approach to engaging students in academic activities. The motivational psychology involved in game-based learning allows students to engage with educational materials playfully and dynamically (Adipat et al., 2021). Game-based learning is not just creating games for students to play, but designing learning activities that can incrementally introduce concepts and guide users towards an end goal (Plass et al., 2015).

2.2. Barriers to game-based learning

Even though game-based learning has gained recognition for its potential to engage students and enhance learning experiences at HEIs, the literature reveals that there are certain barriers to implementing game-based learning in real-world settings, particularly in South Africa. A significant barrier to game-based learning in universities is the need for effective integration with the existing curriculum (Ismaizam et al., 2022). While games can be engaging and educational, aligning them seamlessly with academic goals and learning outcomes requires careful planning and coordination (Bass et al., 2024). Lecturers may face challenges finding the right balance between incorporating games and covering essential content within curriculum constraints (Adipat et al., 2021). Moreover,

a paradigm shift is needed to realign the current negative perception of game-based learning as a mere source of entertainment rather than a serious educational tool (Dahalan et al., 2024; Demirkol & Malkoc, 2023). There is a risk that both educators and students may view these games as distractions rather than valuable learning resources (Danniels & Pyle, 2018). This challenge emphasizes the importance of designing games that are fun, yet purposefully aligned with educational objectives.

Moreover, technological barriers significantly challenge the integration of game-based learning in HEIs. This is particularly challenging in Africa, where poverty is still prevalent (Hu & Venketsamy, 2022); therefore, it is inevitable to influence the adoption of digital games at African HEIs. According to a review conducted by Xu et al. (2023), the literature indicates that recent research on game-based learning in medical education is mostly conducted in developed countries (Choi et al., 2024). Access to appropriate technologies and the necessary technical support can be a challenge, and integrating gaming elements into curricula requires a certain level of digital literacy among both faculty members and the student population. Without adequate support and resources, the full potential of game-based learning may not be realized (Hu, 2023; Noor & Isa, 2023). This includes better alignment of game content with curriculum objectives and ensuring that games are appropriately challenging without being too difficult or too easy. Balancing entertainment with educational content poses a significant challenge in developing game-based learning experiences (Ismaizam et al., 2022).

Cultural and institutional barriers also challenge the adoption of game-based learning in universities (Jossan et al., 2021). Different academic cultures and institutional structures may impact the acceptance and implementation of game-based learning approaches (Kaimara et al., 2021). In addition, concerns about the validity and rigor of game-based assessments may also present a challenge, especially in more traditional academic environments (Kim & Ifenthaler, 2019). Many educators may need more experience or confidence in incorporating games into their teaching methods (Plass et al., 2015). To address these challenges, universities must support faculty professional development to build capacity in game-based learning design and delivery.

2.3. Theoretical Framework

The current study is grounded within the theoretical framework of “social constructivism,” a perspective positing that students actively construct and develop their understanding through lived experiences (Akpan et al., 2020). Originated by Vygotsky (1962), this theory underscores the pivotal role of social interaction in learning, asserting that learning unfolds within the social context. Vygotsky introduced the concept of the “zone of proximal development,” defining it as the space between what learners can accomplish independently and what they can achieve with assistance (Burhanuddin et al., 2021). Contrary to the idea that learning merely assimilates new knowledge, social constructivists, such as Saleem et al. (2021), argue that learning involves social and group interactions that contribute to individual meaning and understanding development. Ramsook (2018) stated that a constructive classroom is characterized by cooperation, where students engage in activities supported by facilitators. Both Piaget and Vygotsky emphasized the importance of students deriving knowledge from their own experiences in a real-world setting, ensuring that academic activities are relevant to their prior knowledge and experiences (Burhanuddin et al., 2021).

According to social constructivism, students construct knowledge to identify and solve problems independently, developing personal interpretations of the world based on their individual experiences and interactions (Saleem et al., 2021). Motivated to be self-aware, self-facilitated and self-regulated students acquire knowledge from each other in group learning settings (Ramsook, 2018). The interaction between student and environmental factors are crucial in creating knowledge for social constructivists (Akpan et al., 2020). While social constructivism recognizes the existence of the natural world, it contends that knowledge of the world is derived from an individual’s interpretation of their experiences (Muhajirah, 2020). Based on this perspective, the learning process

focuses on constructing meaning from experiences rather than rote memorization, prioritizing the learning process itself (Burhanuddin et al., 2021). The author believes game-based learning to be a practical, constructive approach to strengthening learning outcomes. Therefore, the author opted for the social constructivism theory as a theoretical framework to understand participants' lived experiences of game-based learning at the identified HEI.

3. Methodology

3.1. Research Design

For this research, the author employed a qualitative approach embedded within a single case study design in order to delve into students' first-hand experiences engaging in game-based learning within an acupuncture program at a South African HEI. Within this program, students actively proposed and designed a series of academic games, fostering a student-centered approach (see Appendix A). The primary objectives of these activities were to enhance students' grasp of acupuncture content, bolster their confidence, and promote collaborative engagement with their peers. The rationale for adopting a qualitative study design stemmed from exploring the students' nuanced lived experiences (Yin, 2018). This perspective aligns with Yin (2018) and Venketsamy et al. (2023), who stated that qualitative studies are particularly adept at delving into participants' comprehension, attributes, and personal encounters.

The research was conducted at a recognized public university in the Gauteng province of South Africa, which exclusively offers a program in acupuncture. A single case study design was selected, given that the identified HEI represented the sole university providing an acupuncture program in South Africa. This decision resonates with Hu and Venketsamy (2022) and Yin (2018), who advocate using a single case study when the case is critical, unique, prevalent, and pertinent to the researcher's focus. The chosen case was considered necessary due to the perceived significance of optimizing learning outcomes in the acupuncture program, particularly given its noted high failure rate. Its uniqueness stemmed from being the sole accredited acupuncture program in South Africa. At the same time, its prevalence and relevance were evident in the broader context of educational programs within HEIs that necessitate optimizing learning outcomes. This case was selected since it was readily accessible to the author within the identified HEI.

3.2. Participants

Hu and Venketsamy (2022) highlighted the utility of purposive sampling in situations involving a limited population (Cohen et al., 2018). Consequently, the author employed a purposive sampling approach to enlist participants to the current study. An invitation poster for research participation was prominently displayed on a noticeboard at the specified campus. Students who met the inclusion criteria and contacted the author were individually invited to partake in a semi-structured interview. The inclusion criteria necessitated that participants: i) be enrolled in the Bachelor's Degree of Health Sciences in Complementary Medicine; ii) actively engaged in the game-based learning activity, iii) be at least 18 years of age; and, iv) express their voluntary willingness to partake in the current study. Six students who met these criteria consented to their participation in the study and signed a research consent form.

Table 1. Demographical data of study participants

No	Gender	Age (years)	Assigned code
1	Male	23	P1
2	Female	24	P2
3	Female	23	P3
4	Male	21	P4
5	Female	22	P5
6	Female	20	P6

3.3. Data Collection Tools

The semi-structured interviews were conducted between May and July of 2023. The participants and their corresponding codes utilized in the data analysis and reporting are outlined in Table 1. In order to ensure the participants' confidentiality and anonymity, pseudonym codes were consistently employed throughout the research process.

3.4. Data Analysis

In this research, the thematic method of analysis was used to analyze the collected data, as proposed by Braun and Clarke (2006). Hu (2023) and Venketsamy et al. (2023) affirmed thematic analysis to be an approach suitable for analyzing qualitative data since it aids in the discernment of both commonalities and variations in the opinions of a study's participants (Ramiez & Fuentes Esparrell, 2024). Additionally, Hu (2023) concurred with Yin (2018), who highlighted the effectiveness of thematic analysis in identifying significant perspectives within research findings. Consequently, the author adhered to the six-step thematic analysis framework outlined by Braun and Clarke (2006) and also Creswell (2018) to systematically analyze the raw data.

The analysis was conducted inductively, with the author thoroughly reviewing the raw data to gain familiarity (Step 1). Subsequently, the data was coded (Step 2) and then initial themes were identified (Step 3). These initial themes underwent a review in Step 4 and then refinement in Step 5. Ultimately, the author employed these codes and themes to address the research question (Step 6). The author employed various techniques to improve the findings' credibility, conformability, dependability, and transferability to enhance the study's trustworthiness (Venketsamy & Hu, 2024). These techniques encompassed the use of a well-structured research design and methods, comprehensive descriptions of the data, and an audit trail that underwent scrutiny by a second coder.

3.5. Ethical consideration

Ethical considerations were duly addressed with the acquisition of ethical approval from a research committee at a public university in the Gauteng province of South Africa (Reference: REC-1443-2022).

4. Results

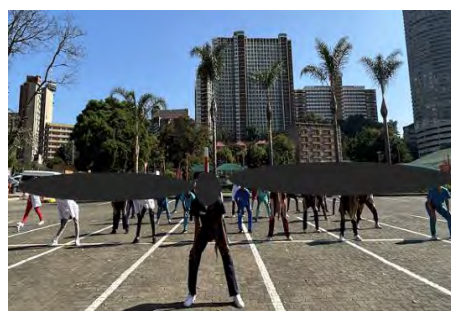
This study explored students' views and experiences of game-based learning in the acupuncture program at the identified HEI in South Africa. Overall, the study's participants expressed favorable perspectives and attitudes regarding their game-based learning experiences. They believed that this educational method was a successful motivator for their involvement in the course, and that it enhanced their interest in learning. However, the students highlighted certain challenges in their experiences with game-based learning which primarily focused on the large group of games, lack of facilitators, absence of feedback, and paucity of available technology. During the study's data analysis, two themes emerged from the raw data: a) the advantages of game-based learning; b) the challenges of game-based learning. Verbatim quotes from the student participants are included in the following subsections.

4.1. Theme 1: Advantages of game-based learning

The findings indicated unanimous positive sentiments among the study's participant cohort regarding game-based learning in the acupuncture program. They all concurred that game-based learning was enjoyable and had a substantial and positive impact on their learning experience. In particular, the acupuncture quiz competition allowed them to pinpoint areas in which they lacked knowledge. Engaging in the Ba Duan Jin exercise within the game left them feeling relaxed and revitalized. Participants P1 and P6 highlighted the benefits of game-based learning in terms of both their mental and overall health. They believed that collaborative efforts and teamwork in the game-based learning exercise helped to enhance their communication skills and bolstered their confidence. Figure 1 illustrates two game-based exercises during the learning activity.



Game 1: 30-sec acupuncture quiz



Game 2: Ba Duan Jin exercise

Figure 1. Game-based learning activities at the identified HEI

P1 expressed that:

The experience was incredibly enjoyable. It made interacting with our course content and revising effortless and enjoyable. Testing each other and engaging with various aspects of acupuncture in Chinese medicine through this method felt highly beneficial for our learning. The entire day provided a much-needed breather, allowing us to momentarily step away from work and assignment deadlines. [P1]

P2 added that: "I had a fantastic time with the activities, especially the 30-second game [acupuncture quiz competition]. Being tested on challenging topics forced me to think quickly, and the Ba Duan Jin exercise was a highlight." Both P3 and P4 shared that game-based learning was enjoyable and helped them identify weaknesses in their studies without inducing stress. They emphasized the positive experiences of interacting with students from different years and fields of study. P3 stated: "I recalled things I didn't know, and I discovered areas I thought I knew but forgot under pressure." P4 articulated that, "I had a wonderful experience, having fun and gaining insights

into areas where I needed improvement through the games we played.” P5 reflected that, “It was a rewarding experience showcasing my profession, performing cupping and needling, and explaining acupuncture to others.”

P6 argued that the game-based learning base improved their physical health through therapeutic exercises and had a positive impact on their mental health by fostering social interaction, and went on to further explain that:

Most students often live alone and don't socialize. Thanks to movements like the Ba Duan Jin exercise, you can have fun, learn, and improve physical health simultaneously. Furthermore, it enhanced my communication skills and providing cupping treatments with people eagerly waiting, improved my overall well-being. [P6]

The findings underscored several advantages of incorporating game-based learning in the acupuncture program. The participants highlighted stress relief, identification of their strengths and weaknesses, enhanced confidence, and improved teamwork as key benefits of the exercise. They unanimously agreed that games served as an effective motivator for learning. P3 emphasized the value of group work, stating that “Working with classmates in a group to provide correct answers demonstrated the helpfulness of collaborative efforts.” P3 further noted that, “Engaging with the content in a fun way alleviates stress and anxiety, fostering pride in representing our faculty during such events.” P4 described it as “fun, informative, and challenging in a positive way, pushing me to think faster than usual.” P6 shared that:

Game-based learning was a valuable tool for accessing information rapidly and dealing with stress, mirroring situations during patient assessments. It allowed me to learn from others' descriptions of points, syndromes, or theories, enhancing my understanding and memory. It's an effective way to revise and learn from our peers. [P6]

4.1. Theme 2: Challenges of game-based learning

Despite the positive views and experiences of game-based learning in the acupuncture programs, the study's findings also highlighted the existence of certain barriers based on the participants' experiences. These barriers predominantly centered around challenges encountered in managing a large group of students during the games, the absence of facilitators, the lack of feedback, and the scarcity of available technology. P1 and P3 both agreed that the large student group during game-based activities and the limited number of facilitators negatively influenced their learning experience. P1 stated that:

We were waiting for the facilitator to review each group before moving on to the next game. However, we had six groups of students participating in the game simultaneously. We were literally sitting and waiting while doing nothing for almost 20 minutes. [P1]

P3 added: “I don't mind having many students in the game. However, it would have been better if we had more facilitators because sitting under the sun and waiting for the facilitator to come to us was the worst experience.” P4 supported this view and further explained that:

Ensuring that everyone actively participated and had their questions addressed became challenging. It felt like some voices were unintentionally drowned out in the crowd, hindering personalized interactions. Furthermore, only one facilitator created a void regarding guidance and support. While the activities were enjoyable, there were moments where clarification on certain concepts or rules would have been beneficial. More facilitators could have enhanced the learning experience by providing structured explanations and addressing queries. [P4]

Apart from the large group and limited number of facilitators, P2 stated that:

The lack of a debriefing session left us without a platform to reflect on the games collectively. After the activities, there was a sense of disconnect as we didn't have the opportunity to discuss our experiences, share insights, and address any misconceptions. A debriefing session would have added depth to the learning outcomes. We should have the same debriefing sessions we had in the clinic after seeing patients. [P2]

P6 stated that:

The absence of a clear debriefing session after the games left me feeling a bit disconnected. While the activities were enjoyable, having a structured reflection and discussion session could have helped consolidate our learning and address any lingering questions or uncertainties. [P6]

Furthermore, P4, P5, and P6 all concurred that although they enjoyed the games in the lesson, it would be more enjoyable if they could have digital games. P4 said that, "In the 21st century, we should consider integrating digital games into our program," and P5 added:

There were no advanced technologies in the game activities, which negatively impacted the effectiveness of our game-based learning. I wish we could have had digital games in our program. These games could have been those most commonly used in China since Dr X [a lecturer in the acupuncture program] recounted experiences from visiting Chinese universities in 2023. [P5]

P6 articulated that, "The absence of digital tools limited our ability to incorporate innovative elements into the activities, impacting the overall engagement and effectiveness of the game-based learning approach."

5. Discussion

5.1. Importance of Game-based Learning

Integrating innovative pedagogical approaches, such as game-based learning, has become increasingly necessary in 21st-century education (Danniels & Pyle, 2018). The reason cited is that game-based learning significantly enhances learning outcomes and improves learning experiences at HEIs (Yacob et al., 2022). The findings of the current study concur with the existing literature in that game-based learning played an important role in promoting student learning in the acupuncture program at the identified South African HEI. The participants highlighted the value of game-based learning in strengthening their content knowledge and other essential skills in the world of work, such as teamwork, critical thinking, and quick reflection. Alomari et al. (2019), and Mallick and Waheed (2024) all report on the benefits of game-based learning to significantly promote interaction and teamwork within HEIs. According to Saleem et al. (2021), students construct new knowledge from their prior experiences. The author believes that the use of games within the acupuncture program significantly strengthened the students' learning outcomes since they became actively engaged throughout the entire learning process. Students develop knowledge based on what they already know compared to what they can do with the help of a facilitator (Akpan et al., 2020; Vygotsky, 1962). This process is fundamental in game-based learning since students are actively involved in the design of the games.

Furthermore, the shift from passive learning to an active, game-like environment has proven to be a game-changer in fostering student engagement (Hashim et al., 2019). The allure of game-based learning lies in its ability to harness the natural inclination of individuals towards competition, challenge, and achievement (Mee et al., 2020; Subhash & Cudney, 2018). The current study highlighted the value of game-based learning in transforming the learning process to become an enjoyable experience for the participant students. As such, it can be said that students find themselves immersed in a world where educational content is seamlessly blended with the elements

of games. The author contends that this not only alleviates the perceived monotony of traditional learning methods, but also cultivates a more positive attitude in students towards the subject matter being taught. The effective employment of game-based learning can transform the learning experience into a thrilling adventure, motivating students to explore and absorb knowledge in a manner that feels more like play than study (Jääskä & Aaltonen, 2022).

Game-based learning provides a platform for experiential learning (Akpan et al., 2020). Instead of passively receiving information, students actively participate in decision making, problem solving, and critical thinking within the context of a game (Burhanuddin et al., 2021; Muhajirah, 2020). This hands-on approach solidifies conceptual understanding and enhances practical skills and the ability to apply knowledge in real-world scenarios. The advantages of game-based learning are multifaceted, encompassing enhanced engagement, experiential learning, skills development, motivation, and community building. As education continues to evolve, integrating dynamic and effective pedagogical approaches such as game-based learning ensures that students are not just recipients of information but active participants in their educational journey (Ramsook, 2018; Saleem et al., 2021).

5.2. Challenges in Game-based Learning at South African HEIs

Although game-based learning effectively promotes students learning at HEIs, the findings of the current study revealed certain challenges in implementing game-based learning at HEIs. The study's findings highlighted that games should be well designed in advance, particularly concerning the number of participants and facilitators. The dynamics of a large group setting inherently introduces challenges to the efficacy of game-based learning. In such settings, individualized attention and personalized guidance may be compromised, impacting the depth of engagement and understanding among students. Significant group dynamics often result in diverse learning styles, preferences, and paces, making it challenging for a one-size-fits-all approach. Students may struggle to actively participate, ask questions, or seek clarification within a more crowded environment, potentially losing the interactive and engaging nature that game-based learning sets out to foster. This finding agrees with the literature, which supports the urgent need to ensure the effectiveness of game-based learning in education programs (Bass et al., 2024). Adipat et al. (2021), Kim and Ifenthaler (2019), Ismaizam et al. (2022), and Bass et al. (2024) all pointed to the importance of substantiating the effectiveness of game-based learning through appropriate design and implementation. The role of a facilitator is of significant importance in promoting learning outcomes. According to the social construction theory, facilitators act as mediators to support students' learning through what they can do by themselves and with additional assistance (Akpan et al., 2020; Muhajirah, 2020).

In addition, feedback is an essential element in education. The findings of the current study identified that debriefing sessions (feedback) were a crucial element in the game-based learning process, serving as an opportunity for reflection, consolidation of learning, and addressing any misconceptions that may have arisen during an activity. The absence of debriefing sessions can hinder the depth of understanding and limit the transformative potential of game-based learning experiences (Dahalan et al., 2024; Danniels & Pyle, 2018). Moreover, since technology plays a critical role in the 21st century, the current study highlighted that its absence in game-based learning can negatively influence the student learning experience. These findings agree with the literature, in that digital gaming appears absent at African HEIs (Xu et al., 2023). One of the most critical reasons for this would appear to be the financial disadvantages experienced among African countries, which negatively influences the development and implementation of digital gaming in African education (Hu, 2023; Hu & Venketsamy, 2022).

6. Conclusion

Game-based learning has emerged as a transformative pedagogical approach, leveraging the interactive and engaging nature of games to enhance knowledge acquisition and skills development

(Hashim et al., 2019; Jääskä & Aaltonen, 2022). The transformation from passive observers to active participants is a cornerstone of the game-based learning narrative. Once confined to the role of information recipients, students now find themselves at the helm of their educational journey. Decision making, critical thinking, and problem solving become theoretical concepts and practical skills honed through the interactive challenges woven into the fabric of educational games. Game-based learning is associated with multiple advantages, including essential skills in the working world. These skills include teamwork, communication, and self-reflection. As students navigate multiplayer scenarios, they discover the power of teamwork, effective communication, and leveraging collective strengths. These collaborative skills, sown in the fertile ground of educational games, bear fruit in the form of a workforce prepared for the intricacies of today's interconnected global landscape.

While game-based learning holds immense potential for transforming health sciences education, technology, culture, and institutional readiness, challenges associated with this genre of teaching/learning approach must be carefully considered. Addressing these barriers requires strategic interventions, including the development of digital infrastructure, cross-cultural adaptation of game-based learning approaches, and investment in faculty professional development. As higher education continues to evolve, understanding and mitigating these challenges will be crucial for unlocking the full potential of game-based learning in health sciences education in South Africa and diverse educational contexts globally.

Despite shedding light on the challenges of implementing game-based learning in health sciences education at a specific South African HEI, this study has certain limitations. Given the unique cultural, technological, and institutional context of South Africa, these constraints affect the generalizability of the findings. The single-case study design may limit broader applicability, and caution is needed when extending these findings to other educational settings. Therefore, the findings of this study require more comparison, and future similar studies could be conducted at larger institutions. While efforts were made in the current study to enhance trustworthiness through member checking and second coder auditing, the possibility of subjective bias influencing the study's analysis and conclusions remains present; a limitation brought about by the interpretivist paradigm. Future studies should be conducted using different approaches, such as quantitative or mixed methods.

7. Suggestions

The author makes the following recommendations based on the findings and discussion presented.

- Educators must explore strategies that promote active participation and collaboration within large groups. Incorporating elements of team-based learning, where students work in smaller groups within the larger class, can encourage peer-to-peer interaction, collaboration, and discussion. This approach can mitigate the limitations of large group sizes, creating a more conducive environment for game-based learning.
- One potential solution involves incorporating digital facilitators or intelligent tutoring systems that can provide real-time feedback, guidance, and support to students during game-based learning activities. These digital tools can emulate the role of a facilitator, offering personalized assistance based on individual progress and performance. Additionally, establishing a peer-led facilitation system, where advanced students take on the role of facilitators, can enhance collaborative learning and alleviate the challenges associated with the absence of a dedicated facilitator.
- Educators should prioritize integrating feedback through debriefing sessions into the learning process. These sessions allow students to articulate their thoughts, share insights, and discuss their experiences.

- Implementing structured debriefing protocols, where students are guided through reflective questions, can enhance the learning outcomes of game-based activities. Additionally, incorporating peer-led debriefing, where students discuss their experiences with each other, fosters a collaborative learning environment and promotes critical-thinking skills.
- To address the technology gap, educational institutions and policymakers must prioritize initiatives that enhance technological infrastructure and provide equitable access to devices and Internet connectivity. Collaborating with governmental and non-governmental organizations to implement technology-driven educational interventions can help bridge the divide. Moreover, educators can explore alternative approaches, such as low-tech or offline game-based learning activities, ensuring that technological limitations do not restrict the benefits of this pedagogical approach.

Declarations

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Appendix

Example of a Game-based Learning Lesson Plan Game-Based Learning Activities

Modules: Complementary Medicine Practice 3

Location: Lecture Hall

Time	Activities	Goals
10:00-10:20	Game 1- Acupuncture Competition 1 (30s quizzes)	Strengthen students' acupuncture content knowledge (basic theories)
10:25-10:35	Game 2- Qigong exercise: Ba Duan Jin	Promote general health
10:40-11:00	Game 3- Acupuncture competition 2 (30s quizzes) <i>Demonstration of acupuncture techniques</i>	Strengthen students' acupuncture content knowledge (acupoints and meridians)
11:05-11:15	South African Performance	Promote culture integration
11:20-11:40	Game 4- Acupuncture Competition 3 (30s quizzes) <i>Demonstration of cupping techniques</i>	Strengthen students' acupuncture content knowledge (acupoints and meridians)
11:45-11:50	Game 5- Qigong exercise: Ba Duan Jin	Promote general health
12:00	Signatures on the posters	
12:00	End	

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