LETTER TO EDITOR

Intelligent Gamification: Integrating Artificial Intelligence and New Educational Methods in Health Sciences

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Dear editor,

With the expansion of digital technologies in the present era, the medical education system has faced significant changes. In the meantime, gamification as a new educational strategy has attracted the attention of many instructors and researchers in the field of medical education. This letter to the editor shares practical experience in using artificial intelligence (AI) to design gamification activities in various nursing courses, including hematology, community health nursing, and individual and family nursing. Educational gamification means the application of game elements and mechanics in non-game learning environments that can increase the motivation, participation, and interaction of learners. Numerous studies have shown that this method in nursing education, especially for courses with complex and heavy content, can significantly improve learning outcomes and clinical reasoning (1, 2). Evidence from a meta-analysis of game-based thinking and gamification in nursing suggests that gamification strategies in nursing education can have a significant impact, particularly on knowledge acquisition (with an effect size of 1.06) (3). In one study, 53 undergraduate students were compared in three groups of instruction with a Gamified Artificial Intelligence Education Robot (GAIER), a non-gamified robot, and traditional instruction. The results showed that the GAIER group was statistically significantly ($p < 0.05$) superior to the other two groups in laboratory safety knowledge post-test, learning motivation, subjective experience, and problem-solving tendency, and reported lower cognitive load. These differences indicate the greater effectiveness of the gamified robot in improving learning and educational behavior compared to non-gamified or traditional methods (4). Another study, by implementing an innovative educational system including video, serious games, problem solving, and the use of AI and virtual reality, showed that nurses and midwives who received modern interactive training had statistically significant improvement in injection skills compared to traditional training (5). These findings highlight the importance of using AI as an efficient tool in the intelligent and personalized design of such learning activities. However, designing effective gamification activities that are aligned with educational goals and can cover the diverse needs of students requires significant time and energy from instructors.

Challenges in designing gamification activities

Designing effective gamification activities in medical education is associated with several fundamental challenges. First, the diversity of medical science course content, from basic sciences such as hematology to clinical and community-oriented courses, requires different approaches in designing educational games. Second, the differences in students' learning characteristics and learning styles make it difficult for the instructor to design the same activities for all students. Third, time and educational resource constraints in many educational centers make it difficult to implement gamification.

Using AI in gamification design

In response to these challenges, AI platforms based on natural language processing (NLP) can be used to design gamification activities. The instructor should master students' preferences, learning theories, teaching methods, principles and elements of gamification, and then use AI as a teaching aid. Gamification can be further improved by dynamically adapting the mechanics and dynamics of gamification to various factors such as the personality, needs, values, performance and motivations of learners. The advancement of AI enables the development of gamification environments compatible with AI techniques (6). To design effective gamified activities, key parameters-including learning objectives, student number and characteristics, session duration, and available facilities-were defined for the AI. The AI was then tasked with generating tailored gamification strategies. Implementing these AI-suggested activities in classroom sessions yielded highly positive outcomes, significantly enhancing student interaction, engagement, knowledge acquisition, and overall satisfaction.

Advantages of using AI

Some education experts believe that the same and fixed method of gamification lacks personalization and adaptability. This impersonal and unchangeable feature has caused researchers and developers to look for more dynamic and flexible models that pay attention to the unique characteristics of each user and benefit from more intrinsic motivations. In this context, AI, with its unique capabilities in automation, adaptation, and personalization, is considered a suitable option for implementing such an approach (7).

Using AI in designing gamification activities provides several important advantages:

1. Time savings: AI significantly reduces the time required to design educational activities.

2. Diversifying educational methods: This technology offers creative and out-of-the-box ideas.

3. Personalizing education: AI enables the design of activities tailored to the learning level and individual needs of students.

4. Increasing student participation: This method promotes the motivation and active participation of learners in the educational process.

Challenges and limitations

Despite numerous advantages, this method was also accompanied by some challenges:

1. Ethical and Privacy Issues: High risk of data misuse or breaches; requires transparency, informed consent, and robust cybersecurity.

2. Equity of Access: Unequal access to devices and reliable internet widens the digital and educational divide.

3. Algorithmic Bias: Biased training data may lead to unfair recommendations or inaccurate outcomes.

4. Over-Reliance on Technology: Excessive dependence reduces human interaction and independent critical thinking.

5. Instructor Training Requirements: Effective use demands ongoing faculty training and adaptation to new tools.

6. Integration Challenges: Difficulty in harmonizing technology with existing curricula and pedagogical models.

7. Impact on Proven Traditional Methods: Poor integration may weaken the benefits of established

Suggestions for the future

Therefore, it is recommended that:

1. Organize targeted workshops to enhance instructors' competencies in AI integration.

2. Develop and validate standardized AI tools tailored for health sciences education through multi-institutional collaborations.

3. Expand pilot studies into larger, structured trials to evaluate long-term learning and skill outcomes.

4. Establish a shared repository of AI-generated gamified activities for adoption by diverse institutions.

AI can be a valuable assistant for medical instructors in active design Gamification techniques work. This technology not only saves design time, but also improves the quality of education by providing innovative ideas. However, the success of this method requires careful supervision by the instructor and adaptation of activities to real classroom conditions. The use of AI to design educational activities must be done carefully to avoid providing incorrect or substandard content. Therefore, instructor supervision and review are essential at all stages of design and implementation. We hope that this experience can inspire other instructors to use new technologies in teaching health professions students.

Ethical Considerations

Ethical issues including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc. have been completely observed by the authors.

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