

APPLICATION AND PEDAGOGICAL REFLECTION OF GAMIFICATION IN SPORTS ANATOMY EDUCATION: EXPLORING STUDENT AGENCY AND INTRINSIC MOTIVATION

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Abstract— This study explores the theoretical framework, application, and pedagogical reflection of gamification in sports anatomy education, aiming to uncover pathways to student agency and intrinsic motivation. The introduction outlines the background and importance of gamified education. In the application section within anatomy education, the study discusses curriculum objectives, teaching strategies, and specific game types and instructional designs in case-based teaching processes. The findings reveal the effectiveness of the OBE model in driving student autonomy, stimulating intrinsic motivation, and fostering critical thinking. The discussion section explores pedagogical reflections on gamification in anatomy education, emphasizing student agency and high engagement levels, cultivating self-directed learning abilities. Limitations of gamifying sports anatomy courses are also addressed, along with future research directions further to enhance the effectiveness and sustainability of gamified education. This study has meaningful practical and guiding implications for applying gamified education in the field of anatomy education

Keywords— Gamification, Sports Anatomy Education, Student Agency, Intrinsic Motivation, Pedagogical Reflection

I. INTRODUCTION

In today's education sector, gamified education, as an innovative teaching method[1], is attracting increasing attention from educators and researchers. Especially in anatomy education, gamified education is considered an effective means of stimulating student interest and improving learning outcomes[2]. This study aims to explore the theoretical framework, application, and pedagogical reflection of gamification in anatomy education, focusing on uncovering pathways to student agency and intrinsic motivation. Firstly, we will introduce the background and importance of gamified education and the challenges and issues in anatomy education. Secondly, we will discuss the specific application of gamification in sports anatomy education, including setting curriculum objectives, instructional design principles, and implementation of case-based teaching. Finally, we will discuss pedagogical reflections on gamified education in sports anatomy education and propose future research directions and suggestions. The results of this study have important practical and guiding significance for promoting innovation in sports anatomy education and enhancing student learning experiences.

II. THEORETICAL FRAMEWORK OF GAMIFIED EDUCATION

1. One of the foundational theories for constructing gamified education is game theory[3]. The game theory encompasses research on game design, mechanics, and dynamics, providing fundamental principles and methods for designing gamified education. For instance, gamified education should have clear goals and rules, provide

challenges and feedback mechanisms, and stimulate students' active participation and motivation. Educators can draw on principles of game design to transform educational content and tasks into engaging and enjoyable game formats, thereby increasing student engagement and learning effectiveness[4].

2. Cognitive theory also plays a vital role in the theoretical framework of gamified education. Cognitive theory focuses on learners' thought processes and knowledge construction[5], helping educators understand students' cognitive characteristics and learning needs. In gamified education, cognitive theory can guide the design of game tasks and difficulty levels to ensure that students can actively think, problem-solve, and construct knowledge during gameplay. By appropriately applying principles of cognitive theory, educators can design gamified learning environments that facilitate student thinking and learning.

3. Another critical theoretical framework is Self-Determination Theory (SDT) [6]. SDT focuses on the development of intrinsic motivation and internal drive within individuals, emphasizing the importance of satisfying students' autonomy, competence, and relatedness needs. In gamified education, SDT can guide educators in designing gamified learning environments that foster students' intrinsic motivation. For example, educators can provide choice-based tasks, set challenging goals, and encourage cooperation and competition among students to satisfy their autonomy, competence, and relatedness needs, promoting active participation and sustained engagement in the learning process.

4. Social Constructivism theory is also a significant component of the theoretical framework of gamified education. Social Constructivism theory posits that learning occurs through interaction with others and participation in social contexts, emphasizing the importance of social interaction and cooperative learning. In gamified education, social constructivism theory can guide educators in designing game-based learning activities with cooperative and competitive elements, promoting student interaction and knowledge co-construction. Through collaboration and communication with others, students can support, motivate, and correct each other in gamified environments, enhancing their understanding and application of anatomy knowledge[7].

III. APPLICATION OF GAMIFICATION IN SPORTS ANATOMY EDUCATION

1. Course Objectives:

To help students better understand muscles and their functions, improving their grasp of sports anatomy knowledge. Increase students' familiarity with muscle series while fostering their interest in sports training.

2. Teaching Approach:

Design card games incorporating game elements to facilitate students' learning of anatomy knowledge through gameplay.

Gamification stimulates students' interest and motivation, aiding them in better understanding the subject matter.

3. Specific Case-Based Teaching Process:

Game Type: Card Game

Teaching Design: Design a tabletop card game called "Common Muscle Series for Physical Training."

- 1) Each card includes different muscle names, illustrations, and their primary functions.
- 2) Each card corresponds to a specific exercise or training activity associated with the respective muscle.
- 3) Cards can be categorized into different levels based on the importance and function of the muscles.
- 4) Students must collect and combine different cards through the game to complete training tasks.

Game Rules:

- 1) Students acquire cards by answering questions or completing tasks.
- 2) Students must combine information from the cards to create the best training plan according to the tasks.
- 3) Students can compete against each other to determine whose training plan is more scientifically sound.

4) Students can improve their ability to combine training plans by continuously collecting cards.

Through this carefully designed card game, students can quickly and joyfully learn anatomy knowledge while cultivating their creativity, critical thinking, and spirit of cooperation. This gamified teaching method effectively enhances students' mastery of anatomy knowledge, stimulates their enthusiasm for sports training, and promotes comprehensive development.

IV. RESEARCH RESULTS

1. OBE Model Drives Student Autonomous Exploration:

Through the design of card games using the Outcome-Based Education (OBE) model, students are guided to explore anatomy knowledge autonomously.

Students actively learn and apply knowledge by collecting and combining cards in the game and designing training plans based on task requirements.

Under the guidance of the OBE model, students pay more attention to practical operation and problem-solving abilities, improving the quality of learning outcomes [8].

2. Effective Stimulation of Intrinsic Motivation:

The gamified teaching method stimulates students' intrinsic motivation, leading them to participate more actively in learning activities [9].

Through the competitiveness and fun of the game, students experience the joy of learning, enhancing their motivation and interest in learning.

The stimulation of intrinsic motivation not only improves students' learning outcomes but also cultivates their ability to think independently and solve problems.

3. Critical Thinking:

The card game design requires students to think and choose according to task requirements, promoting the development of their critical thinking skills.

Students need to evaluate different training plans in the game and analyze their strengths and weaknesses, thereby fostering critical thinking skills in evaluating knowledge and information.

Cultivating critical thinking helps students think more rationally about problems in learning and practice, improving their learning quality and abilities[10].

Based on the above research results, designing a specific sports anatomy card game effectively applies gamified teaching methods in sports anatomy education, helping students better grasp knowledge, stimulating their interest in learning, and cultivating intrinsic motivation and critical thinking skills. This innovative teaching method will

promote students' comprehensive development, improve teaching effectiveness, and enhance learning outcomes.

V. DISCUSSION

1. Pedagogical Reflections on Gamification in Sports Anatomy Education

1) Guiding Students in Autonomous Exploration: The OBE model emphasizes student agency. Through card game design, students are no longer passive recipients of knowledge but actively engage in exploration and application. This learner-centered approach can stimulate students' intrinsic motivation, increase their learning initiative and participation, and design teaching activities and gamified teaching environments that allow students to have more autonomy and exploration space in completing tasks. By involving students in decision-making, strategy formulation, and problem-solving, their intrinsic motivation and interest in learning are sparked.

2) Valuing Individual Differences in Students: In teaching design and assessment, it is essential to consider students' differences, flexibly apply different teaching methods and resources, and meet the diverse learning needs and interests of students. By focusing on students' personalized needs, student agency is promoted.

3) Increasing Student Engagement and Positivity: By increasing the interactivity, fun, and challenge of teaching content, students' interest and intrinsic motivation for learning are stimulated. Guiding students to actively participate in learning activities, explore knowledge autonomously, and cultivate students' critical thinking skills and independent thinking.

4) Cultivating Self-Directed Learning Abilities: Through gamified teaching and task-driven learning methods, students develop habits and skills for self-directed learning. They are allowing students to take on more responsibility and roles in the learning process, fostering their ability for self-directed learning and intrinsic motivation.

2. Limitations of Gamifying Anatomy Courses

1) While gamification brings many advantages to sports anatomy education, limitations also exist. Firstly, gamified education requires careful design and production, which demands time and human resources. Teachers need to deeply understand the principles and methods of gamified teaching to effectively integrate game elements into anatomy courses, which poses specific requirements for teachers' abilities and teaching levels.

2) Gamified education may only be suitable for some students. Different students have varying degrees of acceptance of teaching methods and learning styles; some may need to adapt better to gamified learning methods and prefer traditional lecture and training models. Therefore, when integrating gamification into anatomy courses, individual differences in students should be considered,

and teaching methods should be flexibly adjusted to make teaching more diverse and flexible.

3. Future Research Directions

1) In-depth research on the impact of gamified education on students' performance and learning interests. Using comparative experiments and questionnaire surveys, explore the differences in the effectiveness of gamified education compared to traditional teaching methods, providing scientific evidence for teaching practices.

2) Explore how to further enhance the effectiveness and sustainability of gamified education—incorporating emerging technologies such as virtual and augmented reality, designing sports anatomy education games that are more immersive and interactive, and enhancing students' learning experiences and outcomes.

3) Research on the application of gamified education in other disciplinary areas. Gamified education can bring innovation and change to subject teaching. Future exploration can include applying gamified teaching methods in other disciplines such as chemistry, mathematics, physics, etc., enriching teaching methods, and improving students' learning outcomes. Through continuous research and exploration, gamified education will bring more possibilities and development opportunities to the field of education.

VI. CONCLUSION

This study discusses the theoretical framework, application, and pedagogical reflections of gamification in sports anatomy education. The research results indicate that adopting a student-centered education model in sports anatomy education can effectively promote students' autonomous exploration, stimulate intrinsic motivation, and cultivate critical thinking skills. However, there are still certain limitations to applying gamification in anatomy courses. Future research can further explore integrating gamified and sports anatomy education to improve teaching effectiveness. This study's practical and guiding significance will contribute to the application and development of gamification in sports anatomy education.

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