

# *Gamification in Smart Classes: Implications for Teachers' Role Reform and Teaching Mode Innovation*

**Mu Yang**

*Continuing Education Center, Tianjin Maritime College, Tianjin Haihe Education Park, Tianjin, China*

**Keywords:** Gamification, digitization, smart classes, teaching reform

**Abstract:** Over the past decade, gamification, the use of game design elements in non-game contexts, has gained increasing attention in various domains, including education. As information technology continues to advance, there is a growing interest in exploring its potential to enhance teaching effectiveness, learning experience, and engagement. This paper investigates the application of gamification in smart classes, a new educational model that leverages modern information technology. The study examines the implications of gamified smart classrooms for teachers' role reform and teaching mode innovation. Our findings suggest that teachers need to shift from traditional knowledge transmitters to multiple roles such as facilitators, collaborators, evaluators, and designers. Concurrently, teaching modes should evolve from teacher-centered to student-centered, problem-oriented, and collaboration-based approaches.

## **1. Introduction**

### **1.1. Background and Review of the Current State of the Field**

The rapid advancement of technology and the widespread use of the internet have significantly impacted the field of education. In recent years, there has been growing interest in the application of gamification and smart technology to improve the learning experience and outcomes for students. Gamification, which involves incorporating game design elements into non-game contexts, has been widely explored as a means to increase student motivation and engagement [1]. As educational philosophies continue to evolve, the role of teachers in the classroom must also adapt to these changing technologies and approaches [2]. Concurrently, smart technology, including artificial intelligence (AI), data analytics, and adaptive learning systems, has been increasingly integrated into educational settings to provide personalized learning experiences and support.

Several studies have reported the positive effects of gamification on student motivation, engagement, and learning outcomes [3-5]. However, there is still a need for research on how to effectively integrate gamification and smart technology in classroom settings, and the impact of such integration on teaching and learning practices [6, 7].

## 1.2. Purpose, Methodology, and Significance of the Study

The primary aim of this study is to explore the potential benefits and challenges of implementing a gamified smart classroom and to propose strategies for the successful integration of gamification and smart technology in educational settings. The research employs a mixed-methods approach, incorporating both quantitative and qualitative data collection and analysis methods. The study focuses on investigating the transformation of teachers' roles, the innovation of teaching modes, and the impact on student motivation, engagement, and learning outcomes, in line with recent developments in educational philosophy [2].

The findings of this study contribute to the existing body of knowledge in the field by providing insights into the effective design and implementation of gamified smart classrooms, as well as the potential benefits and challenges associated with their use. Moreover, the study highlights the importance of teacher adaptation and the need for ongoing professional development to ensure the successful integration of gamification and smart technology in educational settings.

In summary, this study explores the integration of gamification and smart technology in the classroom, emphasizing the reform of teachers' roles, teaching mode innovation, and potential benefits for student motivation and learning outcomes. The findings offer valuable insights for educators and policymakers seeking to implement gamified smart classrooms and have significant implications for the future of education.

## 2. Literature Review

Gamification is a concept that applies game design elements and principles to non-game environments, such as education, to increase learner motivation, engagement, and enjoyment. Gamification has been used in a variety of educational settings such as online learning, classroom teaching, engineering education, and higher education. In this literature review, I will summarise the key findings, innovations, and contributions of relevant papers on gamification in education.

The paper by Deterding et al. provides a definition and conceptual framework of gamification based on game design research. The authors propose that gamification is the use of game design elements in non-game contexts to create a gameful experience for users. They also identify three levels of analysis for gamification: individual elements (such as points, badges, and leaderboards), design patterns (such as feedback loops and goal-setting), and models (such as self-determination theory and flow theory) [1]. The paper contributes to the theoretical foundation and understanding of gamification as a phenomenon.

The paper by Yan Shiji explores the change in teacher roles based on the future of educational philosophy. The author argues that teachers need to transform from knowledge transmitters to learning facilitators to cope with the challenges of the 21st century [8]. The author suggests that gamification can be an effective strategy to achieve this transformation by creating a learner-centered environment that fosters autonomy, competence, and relatedness. The paper provides a philosophical perspective and practical implications for teacher development.

The paper by Lee Chin Kho et al. investigated the effectiveness of a gamified learning model for second-year Electrical Engineering Technology (EET) students. The feedback survey revealed that 88% of participants liked the implementation of gamification in engineering courses, and 69.9% agreed that it could increase their engagement in online classes. Additionally, 50.6% of participants preferred the gamification approach compared to other teaching methods. In conclusion, the gamified learning model increased peer competition among participants and their interest in the course. It also helped improve their understanding of the teaching-learning materials. Therefore, gamification can be considered an effective method to enhance student engagement, motivation, and learning outcomes in engineering courses [9].

The paper by Errol Scott Rivera and Claire Louise Palmer Garden presents a framework for the gamification of student engagement, and the study makes four testable propositions:

(1) Gamification is a process through which the state of student engagement can be modified to support the achievement of learning goals.

(2) Learning outcomes can be measurable results of the state between the affective, cognitive, and behavioral domains of student engagement.

(3) Appropriate game attributes can be selected to support the achievement of specific learning goals divided into the cognitive, affective, and psychomotor domains.

(4) By identifying the psychological domains shared between learning outcomes/educational goals and desired student engagement experiences, game attributes for use in gamification strategies can be selected.

Through this framework, educators can target the selection of game attributes to increase student engagement and achieve specific learning goals in the curriculum. The study provides an example of a practical application that illustrates how the framework can be used to achieve specific learning goals [10].

The paper by Wong Mee Mee et al. explores gamification in education plays an important role in improving learners' creative, critical, and problem-solving skills. The integration of interesting and engaging activities sparks learners' interest in language learning subconsciously. In correlation with the findings, participants agreed that the use of gamification activities could further learners' anxiety, and the use of games that are highly motivating and entertaining could attract learners with weak proficiency into participating in classroom learning [11].

### 3. The Study on Digital and Smart Gamified Classes

At the outset of the study, the research team identified the direction and scope of the "smart" classes. The primary objective is to leverage modern technology to enhance the "playfulness" of the classroom within the overall framework of a game-based classroom and to address the limitations of traditional teaching approaches. However, the integration of technology and equipment must be relevant to the goal of gamification and should not be used merely for the sake of being "smart."

The internet and modern technology are considered "digital," and their full potential should be harnessed to create a "smart" curriculum. This will enable personalized learning experiences for different students.

After conducting a literature review and brainstorming sessions, the research team agreed on the core elements of a gamified "smart" classroom. These elements should include:

- Digital clear course or task objectives
- Digital and effective motivation and feedback mechanisms

#### 3.1. Digital and Gamified Design of the Course Objectives

To reorganize the course chapters and sections from a student's perspective, each point and section should be labeled according to factors such as "difficulty of understanding," "difficulty of memorization," "complexity" (number of prior knowledge points), and other relevant indicators. For example, consider the formula for the area of a circle, which is the circumference multiplied by the square of the radius, expressed as  $S = \pi r^2$ , where  $\pi \approx 3.1416$  and  $r$  is the radius. Assuming that a rating system of 1 to 3 is used to indicate ease to difficulty, the "difficulty of understanding" the formula for the area of a circle would be rated 2 (challenging to understand), the "difficulty of remembering" would be rated 1 (relatively easy to remember), and the "complexity" would be rated 3 (since learners need to understand 3 prior knowledge points:  $\pi$ ,  $r$ , and how to calculate the square).

This task cannot be achieved based solely on the teacher's lesson plan and experience. Instead, it

requires a dynamic database system that not only digitizes each point of the course but also considers the possible expansion and adaptation of indicators in the future.

Once a digital database of course objectives is established, gamification can be introduced more scientifically and rationally, following a game-like approach that progresses from easy to difficult. It is even possible to introduce "boss challenges" at appropriate times. Digitizing course objectives provide teachers with more freedom in designing the course, as they can create knowledge "challenges" for students to complete before class or organize live competitions to test their knowledge and skills at appropriate times and occasions. The next research task is to explore how to make full and effective use of digital curriculum objectives to enhance the effectiveness of teaching and learning.

### 3.2. Smart and Gamified Design of Effective Motivation and Feedback Mechanisms

In the beginning, imagine the joy of playing basketball where clever passing, accurate shooting, and putting the ball in the basket result in cheers from the crowd and hugs from teammates. This feeling of accomplishment makes the hard work and sweat from previous practices worth it. Since time immemorial, ball games have been more fun than learning for most people. The subject group identified the core elements of a gamified classroom, which were clear goals and effective motivation and feedback mechanisms. Scoring a basket is the 'clear goal', while the cheering from the crowd and hugs from teammates act as the 'effective incentive and feedback mechanism'.

Today's video games are designed with these principles in mind. Each time a player defeats an enemy or solves a puzzle, they receive points, sound effects, and visual feedback. In King of Glory, for instance, players can earn titles like Bronze, Silver, Gold, and King by continuously achieving victories. Although these titles are virtual and only recognized in-game, there is a consensus on them among a large number of players, and the title of King in the game can still reap the envy and recognition of others in the player community.

Everyone desires recognition and positive feedback for their efforts and dedication. It is difficult for students to fully understand the role of a course when they learn it well at the beginning of their studies. The learning process lacks effective and timely motivation and feedback, and when students encounter teachers who read from a book, they find it difficult to learn the course well unless they have a strong interest and intention in the course. To address these issues and take advantage of the excitement of games, the subject group has made an intelligent and gamified design of effective motivation and feedback mechanisms a top priority of the research.

In the first task, the group digitally organized the curriculum objectives and even the knowledge points to gamify them. The heart of this gamification is a well-designed and effective motivation and feedback mechanism. For instance, let's take the area of a circle as an example: the area of a circle is the circumference x the square of the radius, expressed in letters:  $S = \pi r^2$ ,  $\pi \approx 3.1416$ , and  $r$  is the radius. The group used numbers 1-3 to indicate from easy to difficult, with the "difficulty of understanding" of the circle area formula being 2 (difficult to understand), "difficulty of remembering" being 1 (relatively easy to remember), and "complexity" being 3 (because learners need 3 prior knowledge points  $\pi$ ,  $r$ , and how to calculate the square). Once a student has answered the formula for the area of a circle through the Smart class system, the Smart System needs to record information about the student's answer and provide feedback on whether the answer is correct, how many times they have answered the question, how long it took to answer the question, whether they have improved or regressed compared to their previous best score, how much time they took compared to the fastest answer in the class, how much time they lost compared to the fastest answerer in the class, how fast they beat the class, what the general percentage of correct answers to this question was, and so on. The group interviewed students on the issue of timely

feedback after answering questions. Additionally, if a student answered the area of a circle correctly, the intelligence system would need to increase the "comprehension" by 2, "memory" by 1, and "ability to handle complex problems" by 3 in the student's evaluation system. The increase in value corresponds to the corresponding score for the "difficulty in understanding," "difficulty in remembering," and "complexity" of the question.

Further, with a large amount of student data, teachers can more objectively and scientifically assess and adjust the "difficulty of understanding", "difficulty of remembering" and "complexity" of each knowledge point. Based on these values, the Smart class system algorithm will personalize the level design from easy to difficult for each student. As a result, students will have unique experiences and feelings when learning the same lesson. They will not be presented with difficult points right away and will receive timely feedback and motivation during the learning process, regardless of their basic level.

## 4. Results and Discussion

### 4.1. Teachers' Role Reform

In a gamified smart class, gamification and intelligence aim to break down learning tasks using modern networks, databases, and other technological tools, reshaping them digitally into an intelligent system that effectively motivates students to learn independently and provides timely feedback. However, the design, utilization, and refinement of this intelligent system rely on the teacher. The gamified smart system is like a legendary weapon, but it is up to the user, the teacher, to make the most of it. The teacher is the designer of the gamified curriculum, and the system serves the teacher's ideas and creativity. The teacher plans the framework of the play and sets the stage, with students as the protagonists. The teacher observes the student's learning status, combines data from the intelligence system, analyzes the students' problems, explores their strengths and weaknesses, answers their questions, and guides them. All repetitive and tedious tasks are delegated to the intelligent system, allowing teachers to focus on creative and humane work, communicate more with students, and pay greater attention to them.

The author and the research team believe that after the implementation of a gamified intelligent system, the role of teachers should be transformed in the following ways:

- A change in mindset.

The first change is that the teacher's priority is not to impart knowledge, but to arouse students' enthusiasm for learning, stimulate their interest, guide them to think independently and deeply about the course content, and direct them toward the purpose of learning, showing them the 'endgame' of the course (the scenarios and applications of knowledge related to the course). Teachers need to have a clear ideological perspective and understand that if they are merely passing on knowledge, they will become less valuable and may eventually be replaced by artificial intelligence.

- Change from being the lecturer of knowledge to being the guide of students' independent learning.

The gamified intelligent system is an essential channel for students to acquire knowledge, and the proportion of lectures by teachers has been significantly reduced. Assuming that students can already acquire knowledge effectively through the gamified system or various public classes on the Internet, guiding students' independent learning becomes an important aspect of the teacher's role. Teachers need to use their knowledge, experience, work history, life experience, and personality to influence students and guide them to form a cognitive consensus about the curriculum. They should utilize data from the Gamified Smart Class system to explore students' individual differences, learning characteristics, and personality strengths, creating every possible opportunity to reward,

encourage, and guide students' active learning. Teachers should also create opportunities for students to express themselves, explore, discover, and think deeply.

- Shift from a focus on achievement to a focus on students and teachers themselves.

In both vocational and general education, student grades are not the most important aspect. No teacher can guarantee that their final exam will accurately assess students' abilities. With this in mind, more attention should be devoted to the students themselves. Students observe everything the teacher says and does. They can see how passionate the teacher is and how well they understand and control the curriculum and knowledge and skills. Students can sense whether their teachers are good thinkers, learners, researchers, and doers. The teacher's priority is to pay close attention to the students while continually improving themselves and finding ways to make students feel their enthusiasm, thinking, and perception of the course they are teaching. Teachers must identify the root causes of students' lack of motivation and interest in learning and address their problems and difficulties in the learning process promptly.

- Teacher-student interaction changes from a focus on learning feedback to a focus on building an intimate teacher-student relationship.

As discussed in the previous sections, by building a gamified smart system that addresses effective motivation and feedback mechanisms at a technical level, teachers need to carefully design gamification mechanisms, and the intelligent system can provide timely, scientific, and personalized motivation and feedback to students based on the designed mechanisms and algorithms. In this way, teachers' time and energy can be freed up to devote more to building intimate teacher-student relationships.

As every educator knows, if a student does not like a teacher, he or she will not attend that teacher's class. As teachers, we must be convinced that every student has unlimited potential and that he or she can learn well if they are willing to do so. As students, we also need to have full trust and respect for our teachers. The intimate relationship between teacher and student plays a vital role in the effectiveness of learning. At the heart of teaching and learning is teacher-student interaction, and the foundation of good teacher-student interaction is a close teacher-student relationship. The teacher-student relationship is an important factor in student learning and has a great impact on the effectiveness of student learning. How to use gamification to better integrate students, strengthen interaction, and break down the gap between teachers and students is one of the key elements that the author will study in depth.

## **4.2. Teaching Mode Innovation**

### **4.2.1. Encourage Students to Devote More Energy to Pre-Study Through Gamification Design**

In the traditional teaching model, teachers deliver prepared lessons while students listen passively. However, each student has a different foundation and mastery of knowledge, leading to varying results for the same course content. Teachers have limited energy, making it impossible to cover all unfamiliar points for each student. For students, the omission of a knowledge point can cause difficulties in mastering subsequent content based on that point, and in the long run, these knowledge 'breakpoints' become more frequent. Students' frustration increases, greatly impacting their learning. This is why it is crucial for students to 'self-study' the prior knowledge required for a course before the lesson. To motivate more students to pre-study before class or even review before class, a 'gamification' mechanism is needed.

After digitizing the knowledge and 'pre-knowledge' of the course and creating a database, each student can take a 'final test' before studying the course. The gamification scenario for this "final test" is as follows: the protagonist is about to graduate from university but has neglected class and has not studied properly afterward. The protagonist enters the examination room with little

preparation. Immediately afterward, a practice test for the "final exam" of the course begins.

The questions for this 'final' mock test need to be carefully designed to cover as much of the core content of the course as possible, as well as the most engaging and exciting elements. At the same time, there should not be too many questions, with more than 60% being simple and more than 20% requiring students to use their creativity and imagination. A 'final exam' will give students a first glimpse of the course and build their confidence (they will do well on a test they have never studied before).

After completing the final exam, students receive honors and medals depending on how well they answer the questions. Next, the school awards the student a "time machine" to go back in time and study the course again because of their excellent performance in the "final exam". Simultaneously, the gamified intelligent learning system has already obtained a preliminary grasp of the student's knowledge and foundation through their answers and automatically generates a personalized learning path for the course to facilitate the student's self-study before class. It can be said that at the system level, as long as students are willing to take the first step, the gamified intelligent learning system will continually attract students to self-learning through real-time feedback, incentive, and achievement systems. On top of this, the teacher provides guidance and encouragement, which can maximize the motivation for students to engage in pre-class self-study.

#### **4.2.2. Real-time Cross-fertilization and Efficient Feedback in the Class**

In a gamified smart class, the course content has been 'digitized,' and the teacher's PPT content and the students' mobile phones can be synchronized in real-time. Students can mark each essential point, concept, and vocabulary as "not understood" or "would like further explanation" during the pre-course or in-class lecture. The teacher can see the overall ratio of student feedback for each point in the course content in real-time. For example, if the system shows that 80% of the class says they "don't understand" or "want to explain more" about the circumference of a circle, the teacher needs to consider whether to stop immediately and communicate with the students in time to solve the problem before moving on.

Immediately after teaching important content, teachers can launch a 'knowledge contest' where all students use their mobile phones to answer questions on the spot to review what they have just been taught. Awards, such as electronic medals, can be given based on speed and correctness, creating an opportunity to 'gamify' and motivate students. This approach encourages student engagement in a "gamified" way.

### **5. Conclusion and Implications**

This paper investigates the implementation of modern information technology in developing a novel educational model through the incorporation of gamification in smart classes. The objective is to enhance teaching effectiveness, learning experiences, and student engagement. The integration of gamification into smart classes necessitates a reformation of teacher roles and innovation in teaching models. Teachers must transition from the traditional knowledge transferor role to assuming multiple roles, such as facilitators, collaborators, evaluators, and designers. Simultaneously, teaching models need to shift from being teacher-centered to adopting student-centered, problem-oriented, and collaborative approaches.

This article provides a comprehensive literature review on educational gamification, proposes a conceptual framework for the gamification of smart classes based on game design elements and principles, and analyzes the digitization and enhancement of the gamified class using the learning of the  $\pi$  formula as a case study. In addition, the article discusses how to achieve teacher role reform and teaching model innovation through gamification design.

## 5.1. The Primary Contributions of This Paper

1) Providing an extensive overview of educational gamification from various perspectives, encompassing definition, conceptual framework, and design framework.

2) Proposing an innovative model of smart class gamification that combines technology applications (e.g., internet, artificial intelligence) with game elements (e.g., point medals, leaderboards) and mechanisms (e.g., feedback, goals, rules) to create engaging experiences for learners.

3) Demonstrating how gamification can be applied to different stages of the teaching and learning process, such as pre-teaching class assessment and feedback, using the circular area formula case study. Additionally, it shows how gamification can contribute to teacher role reform and innovation in teaching models by transforming mindsets, encouraging interaction, and enhancing creativity.

## 5.2. The Main Implications of This Paper Suggest

1) Gamification can serve as an effective strategy to address the challenges and opportunities presented by the artificial intelligence era of the information technology age by improving the quality and efficiency of teaching and learning while promoting learner motivation and achievement.

2) Teachers must adapt their roles, skills, and attitudes to fully leverage intelligent systems in designing and implementing gamified lessons and assessments.

3) Teaching models must be innovative to accommodate learners' needs and preferences by creating a collaborative, learner-centered, and problem-oriented environment.

## 5.3. Limitations of This Paper

1) The case study serves as only one example of gamification in the smart class. Further empirical research is required to test and validate the findings across different subjects and contexts.

2) The evaluation of gamification's effectiveness primarily relies on subjective feedback derived from qualitative data. Additional quantitative data and objective measures are necessary to assess the impact on learning outcomes, such as satisfaction, retention, and transfer rates.

3) The paper does not adequately discuss the potential risks of gamification, such as addictiveness, manipulation, deception, privacy, and other ethical concerns. More research is needed to explore ethical principles that balance the benefits and potential harms.

## Acknowledgments

This work was supported by the project of the Tianjin Higher Vocational and Technical Education Research Association in 2021 on the reform of teachers' roles and teaching mode innovation in gamified "smart" classes (2021-3084).

## References

- [1] Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). *From Game Design Elements to Gamefulness: Defining "Gamification"*. *Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments*, 9-15.
- [2] Hamari, J., Koivisto, J., & Sarsa, H. (2014). *Does Gamification Work?—A Literature Review of Empirical Studies on Gamification*. *Proceedings of the 47th Hawaii International Conference on System Sciences (HICSS)*, 3025-3034.
- [3] Lee, J. J. & Hammer, J. (2011). *Gamification in Education: What, How, Why Bother?* *Academic Exchange Quarterly*, 15,1-5.
- [4] Domínguez, A., Saenz-de-Navarrete, J., de-Marcos, L., Fernández-Sanz, L., Pagés, C., & Martínez-Herráiz, J. J.

- (2013). *Gamifying learning experiences: Practical implications and outcomes*. *Computers & Education*, 63, 380-392.
- [5] Seaborn, K., & Fels, D. I. (2015). *Gamification in theory and action: A survey*. *International Journal of Human-Computer Studies*, 74, 14-31.
- [6] Dichev, C., & Dicheva, D. (2017). *Gamifying education: What is known, what is believed and what remains uncertain: A critical review*. *International Journal of Educational Technology in Higher Education*, 14.
- [7] Liu, D., Santhanam, R., & Webster, J. (2017). *Toward meaningful engagement: A framework for design and research of gamified information systems*. *MIS Quarterly*, 41, 1011-1034.
- [8] Yan Shiji. (2022) *Based on the future of educational philosophy to explore the change of teacher role*. *International Journal of New Developments in Education*, 4, 41-43.
- [9] Lee Chin Kho, Sze Song Ngu, Annie Joseph, Dyg Azra Awang Mat, Liang Yew Ng, and Ji Liang Hau. (2022) *Gamification Approach towards Engineering Students' Engagement in Online Learning*. *International Journal of Information and Education Technology*, 12, 485-491.
- [10] Errol Scott Rivera, Claire Louise Palmer Garden (2021). *Gamification for student engagement: a framework*. *Journal of Further and Higher Education*, 45, 999-1012.
- [11] Rita Wong Mee Mee, Tengku Shahrom Tengku Shahdan, Md Rosli Ismail, Khatipah Abd Ghani, Lim Seong Pek, Wong Yee Von, Adelaide Woo, Yugeshineey Subba Rao. (2020). *Role of gamification in classroom teaching: Pre-service teachers' view*. *International Journal of Evaluation and Research in Education*, 9, 684-690.