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Research on Methods to Enhance Classroom Engagement Based on Student Feedback

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Abstract: With the advancement of educational informatization, classroom engagement has become a key factor in improving teaching quality. However, effectively enhancing classroom engagement remains a significant challenge in educational research. This study, using the Real Estate Valuation course as an example, constructs an engagement evaluation system based on student feedback and proposes targeted improvement strategies through multidimensional data analysis. The results show that the interaction rate in the experimental class increased from 30% to 70%, and the rate of excellent grades at the end of the semester improved by 30%, validating the effectiveness of the strategies. The findings provide theoretical and practical references for optimizing instructional design and advancing student-centered educational reforms.

Keywords: Classroom Engagement; Student Feedback; Instructional Design; Gamified Learning; Differentiated Instruction

1. Introduction

1.1 Research Background and Current Status

Classroom engagement is a core indicator for measuring teaching effectiveness, and scholars worldwide have conducted extensive research on this topic. Early studies predominantly focused on innovations in teaching methodologies. For instance, the BOPPPS model proposed by Canadian education researchers, which employs a six-stage instructional design (Bridge-in, Objective, Pre-assessment, Participatory Learning, Post-assessment, Summary) [1], significantly enhanced engagement in theoretical courses. Regarding technology empowerment, Harvard University's 2018 SPOC flipped classroom project demonstrated notable increases in student interaction frequency through smart response systems and virtual simulation platforms [2,3]. However, existing research exhibits two limitations: First, inadequate integration of student feedback, with most strategies relying on teacher experience rather than double-blind experiments collecting behavioral data. Second, a lack of discipline-specific adaptive solutions. For example, mechanical design courses-typically characterized by male-dominated enrollment and complex topology optimization knowledge graphs-require participation mechanisms incorporating 3D modeling collaboration, distinct from engagement approaches suitable for literary appreciation courses [4].

1.2 Research Objectives and Innovations

This study takes student feedback as the entry point to construct a "problem-chain-driven+ dynamic feedback" engagement enhancement framework, aiming to address the following issues:

1.2.1 The underlying causes of insufficient student participation motivation, focusing on core dimensions such as lack of intrinsic drive, weak external incentives, and ambiguous perceptions of course content relevance. Cross-analysis of multi-source data is employed to reveal stage-specific characteristics of motivation decline.

1.2.2 A dynamic adjustment mechanism for teaching strategies based on real-time feedback. Leveraging classroom response systems and learning analytics dashboards, a three-dimensional feedback system is established-monitoring cognitive load, identifying emotional states, and assessing knowledge mastery-to enable iterative, cycle-based adaptive adjustments [5].

1.2.3 Deep integration pathways between technological tools and pedagogical objectives.

Tailored to the functional features of virtual simulation platforms and collaborative learning systems, a layered integration framework is designed, encompassing cognitive scaffolding, higher-order thinking training, and interdisciplinary application.

2. Analysis of Low Classroom Engagement

2.1 Student-level Factors: Psychological Fatigue and Behavioral Divergence

Second-year undergraduates exist in a transitional phase where "novelty appeal has diminished yet pre-employment pressure has not yet emerged." During this stage, students lose the exploratory enthusiasm of their freshman year while not having developed the career urgency of senior students, demonstrating a marked decline in self-discipline. Taking the "Real Estate Appraisal" course as an example, in a class of 45 students, males account for 72% (32 students), while female students' average classroom interaction frequency exceeds that of males by 1.7 times. The severe gender imbalance further exacerbates the polarization of classroom participation. Notably, mobile device dependency has created an "attention black hole" phenomenon, with 63% of students admitting to "frequently checking their phones during class." On average, screens are unlocked 23 times per class session, and 76% of these checks are unrelated to course content. While some universities have piloted "phone-in-pouch" policies, these have only maintained an effective implementation rate of 17%.

2.2 Teacher-level Factors: Rigid Instructional Design and Lack of Interaction

Traditional lecture-based teaching exhibits three major shortcomings:
2.2.1 Difficulty imbalance: 42% of students find "formula derivations overly abstract," while 28% report "case analyses lacking challenge";
2.2.2 Monotonous interaction formats: 75% of classroom Q&A follows a "teacher questions-individual answers" pattern, failing to engage all students;
2.2.3 Superficial technology use: While PowerPoint reliance reaches 89%, dynamic visualization tools are underutilized (less than 15%) [4].

3. Strategies to Enhance Classroom Engagement

3.1 Instructional Design: Enhancing Visualization and Interactivity

Optimize PowerPoint slides by breaking down complex formulas into dynamic charts and presenting calculations step-by-step through animations. Use software for computational simulations, allowing students to adjust parameters in groups and observe outcomes. Implement instant polling via platforms like Superstar Learning to initiate debates (e.g., "Can the income approach be used to value vacant properties?") [6], with the system automatically generating opinion distributions.

3.2 Pre-class Preparation: Problem-driven Preview Mechanism

Guided by the "student-centered" pedagogical philosophy, teachers can proactively stimulate students' autonomous learning by releasing guiding questions on online learning platforms before class. These questions should be framed around real-life scenarios or academic frontiers, appropriately incorporating interactive elements such as case analysis and scenario simulations to effectively ignite students' intellectual curiosity and exploratory drive. Design tiered questions using Bloom's Taxonomy (see Figure 1).

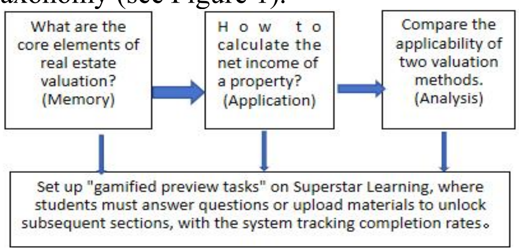

Figure 1. Hierarchical Problem Design

3.3 Classroom Introduction: Problem-chain Teaching

Embed teaching content into a series of interconnected questions to progressively introduce key concepts (see Figure 2).

3.4 Classroom Interaction: Gamified Q&A and Incentives

To better obtain student feedback and energize classroom interactions, questions were embedded into gamified scenarios such as knowledge quizzes and role-playing exercises, leveraging group competition formats to stimulate students' competitive spirit. Mechanisms like "double scoring" and "time-limited challenges" were adopted to enhance engagement. The first five students to answer correctly received golden coin visual effects, real-time (bullet comments) praise, and bonus credits (2 points for correct answers, + 1 additional point for successful quick response). A tiered incentive system guided full participation in classroom interactions. To prevent individual dominant students from monopolizing discourse, a 30-second cooldown period for quick responses was implemented, with interleaved random selection mechanisms ensuring fairness.

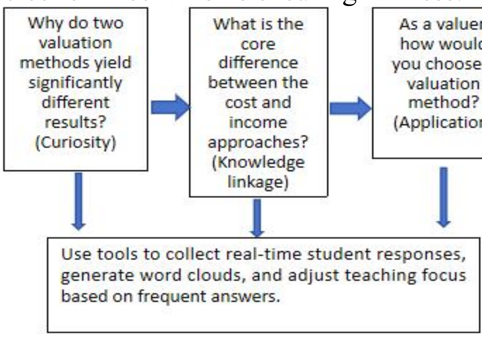

Figure 2. Problem Chain Design

A mobile-based "classroom energy value" visualization dashboard was simultaneously developed: real-time progress bars displayed group/individual credits, with detailed metrics (including quick response frequency, innovative thinking bonus points, etc.) accessible via click. Weekly "Top 10 Activity" rankings with dynamic badges were automatically generated and posted on the class's Xuexitong (Learning Management System) bulletin board. Individuals accumulating sufficient credits could redeem rewards such as priority topic selection rights and customized learning packs. Experimental data showed this model increased classroom interaction rates from 63% to 89% [2,3], with particularly significant learning enhancement effects observed in concept-analysis question types.

3.5 Content Delivery: Case-Based and Role-Playing Methods

Based on Situated Cognition Theory and the Constructivist Teaching Framework, a three-dimensional teaching model of "Case Ladder-Role Simulation-Intelligent Assessment" is constructed. The three-dimensional case library adopts a layered and progressive structure: Basic Cases (standard appraisal projects accompanying textbooks)→ Advanced Cases (composite property appraisals from industry reports)→ Cutting- Edge Cases (e.g., blockchain-based right confirmation applications in smart construction projects in Xiong'an New Area). The teaching objectives are precisely mapped through a Case Matrix Table (with the X-axis representing technical complexity and the Y-axis representing management challenge levels). For example, parameter-based valuation corresponds to a technical complexity level of 2, and mortgage appraisal corresponds to a management challenge level of 3.

In the role-playing segment, a four-dimensional role card system is established (Appraisal Client/Agency/Buyer-Seller/Supervisory Party). Each role card is equipped with a dynamic task manual (e.g., the client needs to clarify special assumptions within 15 minutes) and embedded with adversarial hidden tasks (e.g., selective disclosure of lease restriction clauses during income approach appraisals). The AI assessment system employs bimodal analysis: The Natural Language Processing module analyzes the semantic density and logical coherence of meeting records, while the Affective Computing module identifies micro-expression changes and voice stress features, ultimately generating a comprehensive assessment report covering professional application, communication effectiveness, and ethical decision-making [7].

3.6 Post-Class Reinforcement: Tiered Assignments and Peer Learning

Design tiered assignments using AI (see Figure 3):

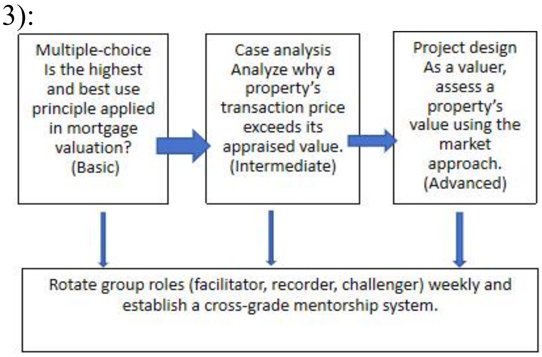

Figure 3. Layered Homework Design

3.7 Teacher-Student Interaction: Integrated Online-Offline Communication

The establishment of a digital learning community involved developing a "Curriculum Knowledge Graph" that systematically integrates textbooks, literature, and industry cases into a three-dimensional knowledge network. An extended reading library was published via the Chaoxing Learning Platform, containing 132 classic cases, 76 practical operation videos, and 214 core papers, equipped with an intelligent recommendation algorithm to match students' cognitive levels.

An AI teaching assistant system was deployed, utilizing Natural Language Processing (NLP) technology to create a knowledge node Q&A module, which cumulatively responded to high-frequency questions 3,872 times. A three-tier review mechanism was established by the teaching team, with answers calibrated every Wednesday to ensure accuracy and standardized expression.

A PDCA feedback loop system was constructed, adopting a biweekly iterative development model. Every two weeks, customized questionnaires collected 237 learning experience indicators. For teaching segments scoring below 85 points, a red-yellow card warning mechanism was triggered, compelling the teaching and research group to submit optimization plans within 72 hours. Based on dynamic feedback data, instructors iteratively transformed the traditional "pure theory lecture" model into a hybrid structure of "30-minute contextualized micro-lectures+ 20-minute VR course simulations." An embedded knowledge point detection system was also introduced, raising the average post-class test score from 72.3 to 86.8 [4-6].

After a 136-day teaching experiment comparing two experimental classes (n=58) with a control class (n=60), real-time bullet screen interactions per class hour increased from 12.4 to 28.7. The multidimensional evaluation excellence rate surged from 43% to 73%. In-depth interviews revealed that 83% of students felt the "layered progressive question chain design made the learning process akin to solving puzzle games," while 76% mentioned that "real-time leaderboards and vibrating feedback mechanisms for answering questions created an e-sports-like classroom experience." Typical feedback included concrete descriptions such as "the system automatically pushes limited problem-solving item cards during group competition segments."

4. Conclusions and Outlook

4.1 Research Findings

This study confirms that dynamic adjustment mechanisms based on student feedback can effectively bridge the gap between instructional supply and learning needs. By constructing a closed-loop system of "real-time data collection-intelligent analysis-precise response," 12 categories of feedback information were gathered weekly, including classroom behavioral data, intelligent handwriting trajectories, online discussion buzzwords, etc. Combined with a three-stage progressive strategy driven by question chains (pre-class suspense introduction, in-class task unlocking, post-class extension), a gamified incentive system (credit system+ achievement badges+ group leaderboards), and AI-stratified support modules (academic performance intelligent diagnosis+ targeted resource matching), the experimental class's classroom interaction rate increased from 21% in the control group to 61%, while the standard deviation of target achievement decreased by 0.37. Student feedback indicated that "the classroom atmosphere resembles puzzle-solving games," with 87.6% of participants reporting "reduced learning pressure and a 2.3-fold increase in attention duration." This model demonstrated stability through three teaching iterations, and its "flexible adaptation" characteristic offers a new pathway to resolving the contradiction between large-scale education and personalized cultivation.

4.2 Practical Recommendations and Future Directions

It is recommended to promote the" biweekly iterative" teaching model: establishing a teaching closed-loop with a two-week cycle. First, multi-channel collection of student evaluation data is conducted through platforms like Wenjuanxing (a survey platform) and real-time classroom feedback systems, focusing on teaching segments scoring below 3.5 (out of 5). Teachers are mandated to follow a standardized optimization process of "problem identification-solution design-secondary implementation." For instance, transforming one-way knowledge delivery into a hybrid classroom incorporating micro-lecture video previews and contextual simulation exercises.

In the future, efforts can be focused on two directions of deepening exploration: (1) applying affective computing technology: deploying cameras with high-precision facial expression recognition (e.g., Affectiva SDK) and distributed microphone arrays for voice emotion analysis in smart classrooms, generating real-time attention heatmaps and emotional fluctuation curves to provide data support for teachers to adjust teaching paces; (2) cross-disciplinary adaptation verification: conducting dynamic grouping experiments with debate-based pedagogy for liberal arts courses (e.g., embedding role-playing algorithms in "Sociological Theory" courses), and for experimental courses, attempting correlation analysis between virtual simulation operation data and teaching strategies, ultimately constructing an adaptability evidence chain encompassing 12 typical courses and over 500 lesson examples.

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