Design and Implementation Effectiveness of Smart Teaching Based on Rain Classroom--Taking Tourism Economics Course as an Example

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Abstract: Empowering education and teaching through modern technology to promote intelligence and informatization is an important aspect of higher education reform. Taking the "Tourism Economics" course as an example, this article explores the effectiveness of course design and implementation based on the Rain Classroom smart teaching platform, utilizing student post-course questionnaires from the last three semesters. It focuses on evaluating the effectiveness of smart teaching from the perspective of students. The research indicates that students are generally satisfied with the effectiveness of smart teaching based on Rain Classroom. Further analysis reveals that this satisfaction is largely due to the platform's ability to offer more varied and interactive classroom activities, accurately and comprehensively reflect students' ongoing learning states, and stimulate students' enthusiasm and autonomy in learning, thereby effectively empowering classroom education.

1. Introduction

"China Education Modernization 2035" outlines the necessity to "accelerate educational reform in the information era" by utilizing education informatization to drive education modernization. The document also emphasizes "exploring new teaching methods," "promoting in-depth integration of information technology and teaching," and "developing intelligent education assistants to analyze and evaluate the entire process of teaching and learning, assisting schools and teachers in timely improvements, and exploring comprehensive student assessment." Promoting education modernization is a requirement for building a strong education system. In fact, the Central Committee of the Communist Party of China and the State Council have always placed great emphasis on education modernization. As early as 2010, the "Outline of the National Medium- and Long-Term Plan for Education Reform and Development (2010–2020)" specifically required "accelerating the process of education informatization" and emphasized "strengthening the application of information technology, updating teaching concepts, improving teaching methods, and enhancing teaching effectiveness." Over the past decade, China has actively explored education informatization and smart education, achieving significant results.

Addressing the common issues of traditional teaching, such as single teaching methods, outdated content, and suboptimal teaching outcomes—as well as low student attendance, participation, and engagement—technology-empowered innovation in teaching concepts and technological transformations has become an important focus of education modernization. Recently, various smart teaching software and platforms, such as Rain Classroom, ClassIn, and MOOC Classroom, have emerged in the educational field, significantly advancing the process of educational informatization. Many scholars have conducted research on teaching reform under the "Internet+" context: Luo Shengquan elaborated on the conceptual connotation of smart teaching [1], Xing Xishen theoretically analyzed classroom practice and issues in smart teaching [2], and Li Ling constructed a multidimensional indicator system for intelligent classroom analysis [3]. Further concentrated discussions have been conducted on the models of smart teaching [4-6]. Despite the increasing number of research outcomes over the past decade and the shift from theoretical discourse to design and application [7], how effective are these smart teaching platforms in actual practice? Existing

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studies have rarely focused on this aspect. This paper uses the Rain Classroom smart teaching platform as an example to explore its effectiveness in theoretical classroom teaching.

2. Design and Practical Application of Smart Teaching in "Tourism Economics" Based on Rain Classroom

2.1. Overview of the Rain Classroom Smart Teaching Platform

Rain Classroom, launched by Tsinghua University, is a smart teaching tool mainly targeting higher education, developed in the context of mobile internet and big data [8]. By installing Rain Classroom software, it integrates into the desktop version of PowerPoint, and students can access the smart classroom via WeChat QR code scanning on their smartphones. The hardware ecosystem of Rain Classroom consists of teachers' and students' smartphones, desktop computers, and remote servers. Remote servers are used for data collection, recording, and storage during smart teaching, while teachers' desktop computers are for course management and instructional design. In the classroom, teachers use their smartphones as a control center for teaching activities and to monitor classroom dynamics, while the classroom's multimedia computer is used to display course content and interactions. Students can participate in class activities and review materials using their smartphones, as shown in Figure 1.

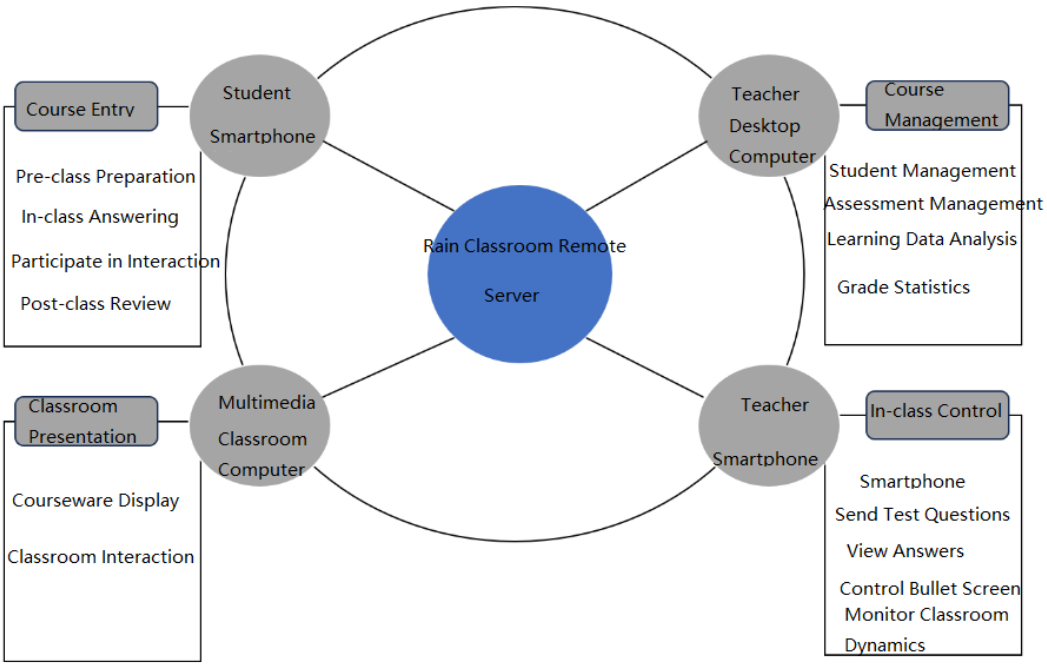

Figure 1: Composition of the Smart Teaching System Based on Rain Classroom

Compared to traditional teaching methods, Rain Classroom enables modern information technology integration. Through mobile internet technology and smartphone terminals, it facilitates real-time classroom interaction and allows for comprehensive data monitoring and evaluation of the teaching process, providing multiple conveniences for teachers and students alike.

2.2. Course Design and Application Based on Rain Classroom

When using Rain Classroom, teachers first need to download and install the Rain Classroom software from the official website. Once installed, Rain Classroom appears as a plugin in PowerPoint. After opening PowerPoint, "Rain Classroom" appears at the end of the toolbar. Teachers log in using WeChat and can prepare lessons, design course content, and instructional steps. For instance, course tests can be embedded in advance, supporting various question types such as single choice, multiple choice, fill-in-the-blank, and subjective questions. Each type of question can have its own point allocation and answer explanation. Teachers can also insert MOOC videos or online teaching resources as needed, and upload pre-made PowerPoint courseware to the Rain Classroom platform.

The computer in the teaching classroom also needs to have Rain Classroom installed in advance.

In the classroom, after opening the PowerPoint courseware, teachers log in to the Rain Classroom platform using WeChat and select the appropriate course and class. If logging in for the first time, teachers need to create a course and class name. Clicking "Start Rain Classroom Teaching" generates a classroom QR code and a classroom code composed of letters and numbers. Students can scan the QR code or manually enter the code to join the class. When scanning Rain Classroom for the first time, students need to complete their personal information on the platform, such as name, student ID, school, and major, to facilitate data export and aggregation later.

Rain Classroom connects the teacher's mobile terminal, the classroom computer terminal, and the student's mobile terminal. The student's smartphone displays the PowerPoint slides in real-time, allowing them to bookmark content they do not understand. In presentation mode, the teacher's smartphone becomes the primary control hub. The teacher's phone synchronizes with the PowerPoint pages on the classroom computer. Teachers can use their phone as a remote to turn pages, or browse thumbnails of the slides, which display not only the PowerPoint pages but also student feedback such as "Do not understand." This allows teachers to address areas of confusion in real-time. Teachers can also monitor classroom dynamics, including the number of students currently attending and toggle functions like bullet screens, which allow anonymous comments from students. Moreover, teachers can conduct random name calls or switch to the student's perspective. During class tests, teachers can set time limits based on the difficulty of the questions. After students submit their answers, objective questions (single-choice, multiple-choice, and fill-in-the-blank) are graded automatically by the platform, while subjective questions require grading by the teacher after class. When discussing the results, teachers can project overall results onto the multimedia screen or showcase typical answers for discussion, thus gaining a comprehensive understanding of student learning and offering real-time feedback.

2.3. Smart Teaching Practice of "Tourism Economics" Based on Rain Classroom

"Tourism Economics" is a compulsory course for tourism management majors and a core subject. The course aims to provide students with a deep understanding of the nature of the tourism industry, comprehensive knowledge of tourism economic analysis methods, familiarity with the trends and characteristics of the tourism industry both domestically and internationally, and the ability to use basic economic theory to analyze phenomena in the tourism sector.

Since 2020, the author has been using the Rain Classroom smart teaching tool and has taught "Tourism Economics" to nine classes over five semesters. According to data from the school’s academic system, the average satisfaction rate for teaching evaluation across these nine classes is 93.74%, indicating that students are generally satisfied with the smart teaching approach in "Tourism Economics."

In the teaching of "Tourism Economics," the smart platform is mainly used for attendance management, class tests, class discussions, random name-calling, and course reflections. During classroom tests, objective and subjective questions are designed based on the course content. Discussions on hot topics in the tourism industry are also initiated on the Rain Classroom platform during the class. At the end of the semester, students are also invited to write reflections on their learning experience using the Rain Classroom platform.

3. Evaluation of the Effectiveness of Rain Classroom Smart Teaching from the Student Perspective

After the end of each semester, students are invited to complete a post-course questionnaire to gather timely feedback on the teaching experience. Based on 316 valid questionnaires collected from the "Tourism Economics" course over three semesters (2022-2024), as well as student reflections written on the Rain Classroom platform, the effectiveness of smart teaching is evaluated from the student perspective.

3.1. Student Satisfaction with Rain Classroom Teaching Tools

According to the survey, 56% of students were very satisfied with the Rain Classroom smart teaching tool, 35.8% were quite satisfied, and the combined satisfaction rate was 91.8%. Another 7.9% of students were somewhat dissatisfied, and 0.3% were very dissatisfied. Feedback from dissatisfied students indicated that the main reason for dissatisfaction was insufficient time allocated during classroom tests, as some students felt they could not submit answers in time. For instance, some students commented, "The time allocated for answering questions in Rain Classroom could be longer, as I sometimes can't submit on time." A small number of students also reported issues such as phone crashes or poor classroom internet connection, which hindered timely submission during class tests.

3.2. Student Satisfaction with the Course

In the post-course questionnaire, students were asked about their overall satisfaction with the course and various sub-aspects. For the overall course satisfaction, 63% chose "very satisfied," and 34.2% chose "quite satisfied," with an overall satisfaction rate of 97.2%. This indicates that incorporating Rain Classroom significantly improved the teaching effectiveness of "Tourism Economics," with a notable increase in student satisfaction. Specifically, for the item "Gaining a deeper understanding of tourism economic phenomena through the course," 41.8% of students chose "strongly agree," and 50.9% chose "agree," resulting in a total agreement rate of 92.7%. For the item "Learning how to analyze tourism economic phenomena through the course," 38.6% chose "strongly agree," and 53.2% chose "agree," with a total agreement rate of 91.8%. For "Acquiring critical thinking skills through course learning and training," 44.6% chose "strongly agree," and 48.1% chose "agree," with an agreement rate of 92.7%. For "Acquiring logical thinking skills through course learning and training," 40.2% chose "strongly agree," and 50.9% chose "agree," with an agreement rate of 91.1%.

The above survey results indicate that the "Tourism Economics" course achieved its intended educational objectives and outcomes. Through the course, students were able to apply theoretical analysis to economic phenomena in the tourism sector, based on their understanding of fundamental tourism economics theories. Moreover, the application of Rain Classroom in smart teaching also facilitated training and improvement in students' critical and logical thinking skills. Although the questionnaire data reflects the outcomes of student learning, how Rain Classroom facilitated these achievements remains unclear. The following analysis, based on students' reflections, will address this question.

4. Analysis of the Effectiveness of Smart Teaching in "Tourism Economics" Based on Student Reflections

Over three semesters of teaching "Tourism Economics" (2022-2024), students have written more than 80,000 words of course reflections. Based on these reflections, the use of Rain Classroom can be seen to enhance the educational experience in three main ways: enriching classroom interactions, accurately reflecting students' ongoing learning states, and enhancing students' enthusiasm and autonomy in learning.

4.1. Enriching Classroom Interactions and Increasing Student Engagement

The construction of first-class courses must first overcome the drawbacks of traditional "spoon-fed" teaching, which is centered around teaching and lacks interaction [9]. Rain Classroom offers interactive features such as class tests, random name-calling, and bullet screens, which enrich the forms of classroom interaction. In the "Tourism Economics" course, the author frequently uses class tests and random name-calling.

Class tests are designed in advance based on the theoretical needs of the course. During the lecture, students are required to answer these questions, and their performance is counted towards their overall assessment score. This immediate consolidation of theoretical knowledge has been effective in reinforcing learning. As noted by a student from the 2019 cohort, "Using Rain Classroom to interact

with us allows us to think and practice while learning, which has been very important for mastering the knowledge (WYY-2019)." Moreover, the use of tests and bullet screens encourages introverted students to participate in class, making classroom interaction more inclusive, as a student from the 2021 cohort commented: "I think many introverted classmates find it easier to express their thoughts in this online format (XGY-2021)."

Random name-calling is mainly used to recap theoretical knowledge or initiate open discussions. It creates a certain level of tension for each student, prompting them to stay engaged, follow the teacher's thought process, and be prepared to answer. This helps improve student concentration and prevents distraction, as noted by a student from the 2020 cohort: "The discussions in Rain Classroom were thrilling, and typing quickly on the keyboard was the most fun part of class. Everyone participated actively (CX-2020)," and "The Q&A session with Rain Classroom helps us follow the teacher's train of thought (ZHPC-2020)."

4.2. Accurately Reflecting Student Learning States and Enhancing Course Evaluation

Keeping students actively engaged is a vital component of undergraduate education reform. The traditional evaluation of "only grades" fails to fully reflect students' learning outcomes and overall quality of talent cultivation [10]. Strengthening process-based assessment is a necessary direction for higher education reform. Therefore, increasing the weight of continuous assessment and encouraging students to engage more in course exercises and critical thinking are key components of the current reform in higher education. Students' willingness to stay engaged depends on their continuous efforts being objectively recorded and incorporated into their academic evaluations. The Rain Classroom smart teaching tool offers comprehensive technical support for strengthening process-based assessment and accurately reflecting students' ongoing learning states.

In the "Tourism Economics" course taught by the author, the final exam and continuous assessment each account for 50% of the total score. Continuous assessment includes several aspects such as attendance, class tests, class discussions, and peer evaluation, and students must pass each aspect for their final exam score to be valid. Attendance and class tests are managed through the Rain Classroom platform. Rain Classroom's QR code-based attendance provides an accurate record for student attendance, while the platform's class tests greatly save the instructor's time and effort in grading. Rain Classroom automatically grades objective questions, and the instructor only needs to grade subjective questions. As a student from the 2019 cohort mentioned: "Mr. Cai's class is quite exciting because he often posts class discussion questions on Rain Classroom, giving us some time to discuss with our classmates and then answer within a time limit. Mr. Cai scores our responses and performance after class (WHQ-2019)." Rain Classroom also provides complete process data for continuous assessment. Instructors can use the data on student submissions and performance to further improve and adjust future teaching.

Overall, the use of the Rain Classroom smart platform provides technical assistance for strengthening students' continuous assessment and makes multi-stage assessment not only possible but also provides complete data records, avoiding the shortcomings of subjective grading in traditional teaching. This ensures that the evaluation reflects students' actual academic performance more authentically.

4.3. Enhancing Student Enthusiasm and Autonomy, Fostering Independent Thinking

The use of the Rain Classroom teaching tool enhances student enthusiasm and autonomy. On one hand, the rich and flexible classroom interaction significantly increases students' engagement and participation. As mentioned earlier, Rain Classroom enriches the forms of interaction, making interaction between teachers and students more flexible and diverse, adding a layer of fun to the learning experience. University classrooms are no longer dull lectures but instead become interactive processes where knowledge is co-created by teachers and students. On the other hand, completed lecture PowerPoints are available on the Rain Classroom platform, allowing students to log in and review the material at any time. This notion is well supported by student reflections, such as those from the 2019 cohort: "Mr. Cai always integrates cases, literature, and textbook knowledge and uses Rain Classroom for timed answers, improving our enthusiasm for learning and cultivating our ability

to learn independently and analyze tourism economic issues critically (TMT-2019)." Students from the 2021 cohort also expressed similar feelings: "Almost every class, the teacher writes a few questions on the PowerPoint and then posts them on Rain Classroom for us to answer, which improves our enthusiasm and focus to a certain extent (ZHP-2021)."

The use of Rain Classroom smart teaching tools has brought new vitality to university classroom education. Students can effectively participate in classroom learning through the Rain Classroom platform, and instructors can enhance course design and conduct more comprehensive process evaluations. The increased enthusiasm and autonomy in learning have rekindled students' intrinsic motivation for learning and improved their independent thinking skills, ultimately achieving the goal of intellectual training. As a student from the 2022 cohort said: "The most impressive part of classroom learning is the cultivation of critical thinking. A lot of time was spent on this during the class, making me feel that the classroom was open and inclusive. Perhaps this is what a university classroom should be like (LX-2022)."

5. Conclusion

Informatization and smart education are inevitable trends in the development of higher education in China. How to enhance the quality of university teaching through technology empowerment has always been a hot topic of concern in academia and is also the key to building "golden courses." This article uses the Rain Classroom smart education platform as an example, analyzing its effectiveness in the "Tourism Economics" course from the students' perspective. Overall, students have shown a high satisfaction rate of 97.2% with the use of Rain Classroom. Further analysis reveals that students benefited from smart teaching mainly in three aspects: enriched and diverse classroom interactions, accurate and comprehensive reflections on their learning processes, and increased enthusiasm and autonomy in learning. Thus, the Rain Classroom smart education tool has greatly empowered higher education. As technology advances, the continuous improvement of smart education platforms will further promote the smartification of higher education classrooms.

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