

Promoting Learning through Assessment: Practice and Effectiveness Evaluation of In-Class Quizzes as a Substitute for Class Summaries

-- A Case Study of the 'Medical Information Analysis and Decision Making' Course

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Abstract

This paper explores the teaching strategy of "Promoting Learning through Assessment", which involves replacing traditional Class Summaries with In-Class Quizzes to enhance the teaching effectiveness of the "Medical Information Analysis and Decision Making" course. By collecting and analyzing the in-class quiz scores of 114 students, combined with a questionnaire survey, this study evaluates the practical effects of this teaching method. The results indicate that In-Class Quizzes effectively improve students' classroom engagement and knowledge mastery. Trend analysis of the normalized scores reveals a steady improvement in student performance. The questionnaire survey results show that students are satisfied with the timeliness of feedback and grading from the quizzes and believe that it aids in deepening their understanding of the course content. The analysis supports the effectiveness of In-Class Quizzes as an alternative to Class Summaries, providing an empirical basis for the innovation of teaching methods.

Keywords

Promoting Learning through Assessment; In-Class Quizzes; Class Summaries; Teaching Effectiveness; Teaching Evaluation.

1. Introduction

In the field of modern education, innovative teaching methods play a crucial role in enhancing learning efficiency and increasing student engagement. "Medical Information Analysis and Decision Making" as a specialized course that requires a combination of advanced theoretical knowledge and practical skills, sets high standards for students' analytical and decision-making abilities. However, traditional teaching models, especially the class summary segment, often fail to fully stimulate students' interest and initiative, limiting the further improvement of teaching effectiveness. To address this challenge, this paper proposes a new teaching strategy-Promoting Learning through Assessment, which involves replacing traditional Class Summaries with In-Class Quizzes to enhance student participation and deepen the understanding of knowledge, thereby achieving a more effective learning experience.

In-Class Quizzes, as a teaching strategy, were initially difficult to implement due to the time-consuming processes of exam paper creation, printing, grading, analysis, and summarization. However, with the rise of smart teaching tools, the application of In-Class Quizzes in teaching has gradually increased. For instance, the use of foreign platforms such as Blackboard and Canvas LMS [1,2,3], as well as the open-source learning management system Moodle [4,5], has become more prevalent. Domestically, in 2019, Yang Xin and others successfully implemented

In-Class Quizzes in medical elective courses by leveraging the simplicity and statistical analysis capabilities of Question Star [6]. Subsequently, with the emergence of smart teaching tools like Rain Classroom, In-Class Quizzes have been implemented in more courses. In 2021, Feng Xiaoli and others applied In-Class Quizzes in circulatory physiology teaching based on Rain Classroom [7], with three multiple-choice questions per session, each question lasting one minute, and questions were released at corresponding knowledge points. The test results indicated that In-Class Quizzes based on Rain Classroom are an applicable method to promote student learning. However, there are issues with the reserved time and the number of questions. In 2023, Zhang Jinjing and others also used In-Class Quizzes in the theoretical teaching of surgical nursing, combined with Rain Classroom [8], which was well-received by students, achieved good satisfaction, and improved students' exam scores. This type of In-Class Quiz is interspersed among the corresponding knowledge points in classroom teaching, has its advantages, but sometimes the reserved one-minute answering time is too long, and sometimes too many questions result in the teaching content not being completed within the normal class hours. Chen Yujuan and others applied In-Class Quizzes combined with error-correction teaching methods in diagnostic experiment teaching [9], setting aside 40 minutes in each experiment class for In-Class Quizzes and error correction, the teaching effect was good, and students generally believed that this teaching method could promote understanding and strengthen memory, etc. However, considering the arrangement of theoretical courses, arranging a 40-minute In-Class Quiz activity in actual operation is difficult.

Although In-Class Quizzes have shown significant advantages in enhancing student learning outcomes, how to effectively schedule the time and duration of quizzes in theoretical courses remains a strategic issue that needs careful planning. This involves not only how to arrange efficient and appropriately timed quizzes within the limited classroom time but also considering the best timing for testing—whether to introduce them at the beginning of the course to activate students' thinking, to conduct them midway through the course to consolidate knowledge points, or to combine them with traditional Class Summaries near the end of the class to improve learning efficiency and make full use of classroom time.

In traditional teaching models, Class Summaries are seen as the concluding segment of course learning, aimed at helping students review and consolidate the knowledge acquired in class. However, with the advancement of educational technology and the renewal of teaching philosophies, the form and function of Class Summaries are also continuously evolving and expanding. For instance, Song Gongyu and colleagues have reformed the Class Summaries of the systemic anatomy nervous system experiment course by innovatively utilizing the digital tools of the "China Digital Human Anatomy System" [10]. This reform has enhanced students' interest in learning and their examination scores, providing a new perspective for the optimization of Class Summaries.

Considering the significant advantages of In-Class Quizzes in enhancing learning efficiency and student engagement, and the limitations of existing Class Summaries that may not fully stimulate students' active participation, this paper proposes an innovative teaching model: replacing traditional Class Summaries with In-Class Quizzes. This approach aims to improve teaching efficiency and learning outcomes without increasing the students' classroom learning time, by leveraging the critical moment of Class Summaries.

2. In-Class Quizzes based on the Superstar Learning Management System

"Medical Information Analysis and Decision Making" is a compulsory specialized course for the Information Resource Management and Statistics majors at our university. The total class hours are 51, with 36 hours dedicated to theoretical study, taught by two instructors over 12 sessions. The course grade is composed of two parts: regular performance and final exam scores, with

the regular performance accounting for 30% and the final exam for 70%. The regular performance consists of the completion of experiments and In-Class Quiz scores, each constituting 50%. A total of five In-Class Quizzes were conducted, with each quiz accounting for 20%. The use of the Superstar Learning Management System's In-Class Quizzes replaces the traditional Class Summaries, with the specific steps as follows:

2.1. Designing Targeted In-Class Quizzes

We have meticulously planned and implemented a series of targeted In-Class Quizzes that not only comprehensively cover the key and challenging points of the course but are also specifically designed to address potential issues students may encounter in understanding. By carefully crafted questions, we guide students to actively explore and apply new knowledge. This strategy helps students to promptly identify and reinforce their weak areas of knowledge, thereby establishing a more solid foundation for course learning.

2.2. Utilizing the Superstar Learning Management System

The use of the Superstar Learning Management System greatly enhances the flexibility and efficiency of teaching. Through the platform's tools, instructors can quickly publish In-Class Quiz questions and collect students' responses in real-time. This immediacy not only provides students with a convenient learning channel but also offers instructors a robust teaching support system, enabling them to rapidly obtain feedback on students' learning and adjust their teaching strategies accordingly. Furthermore, the Superstar platform equips instructors with powerful data analysis tools, allowing them to monitor students' quiz performance and assess their overall academic performance in real-time.

The specific operational Procedure for implementing in-class quizzes Utilizing the Superstar Learning Management System is as follows:

2.2.1. Establishing a Question Bank

In the new version of the Superstar Learning Management System, enter the course and select "Question Bank" to create a question bank by chapters. First, click "New Folder", then "Bulk Import" and "Smart Import" to upload questions that have been prepared in advance.

2.2.2. Selecting Questions

In the "Class Activities" section of the course, select the class, click "Add Activity", choose "In-Class Practice", select "Select Questions from Question Bank", choose the corresponding chapter folder, and check the appropriate questions.

2.2.3. Setting Up In-Class Practice

After "Completing Question Selection", set options such as "Allow viewing correct answers after the end", "Allow modifying answers before the end" and "Automatic submission after activity ends". After setting, click "Save" and name the activity.

2.2.4. Publishing the In-Class Quiz

During the class summary session of the class, select the class in the course and choose an established In-Class Practice. Click "Start Immediately" to deploy it to the students with one click. Students receive the quiz notification and answer the questions directly on their mobile devices.

2.2.5. Immediate Feedback

Students can submit their papers actively or the system will automatically collect them at the end of the activity. After completing the quiz, students can immediately obtain their scores and answers, which not only helps them quickly understand their mastery of the material but also promotes timely identification and understanding of their mistakes.

2.2.6. Scoring Statistics

At the end of the term, export the In-Class Quiz scores through the statistical functions of the Superstar Learning Management System, and calculate the students' regular performance scores accordingly.

3. Results Analysis

3.1. Questionnaire Survey Results Analysis

The innovation of replacing Class Summaries with In-Class Quizzes in the "Medical Information Analysis and Decision Making" course was evaluated through a questionnaire survey, which collected direct feedback from 22 students in one class. The questionnaire primarily investigated students' opinions on In-Class Quizzes as a substitute for traditional Class Summaries, whether In-Class Quizzes improved students' focus in class, the extent to which In-Class Quizzes helped students understand and grasp the knowledge points of the course, and the satisfaction level of students with the timeliness of feedback and grading on In-Class Quizzes. The results of the questionnaire survey are shown in Figs 1, 2, 3, and 4, respectively.

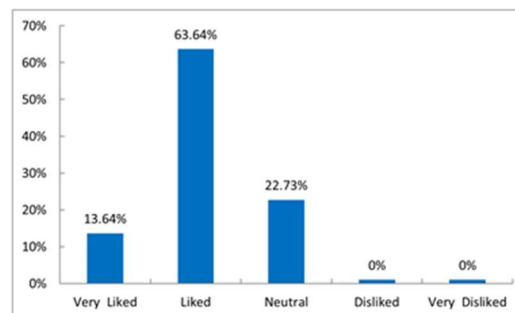


Fig. 1 Students' Views on Replacing Classroom Summaries with In-Class Quizzes

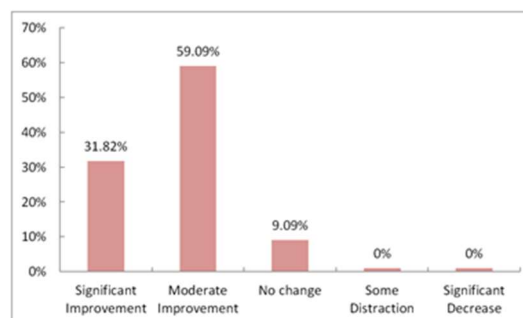


Fig. 2 Improvement in Students' Classroom Focus Due to In-Class Quizzes

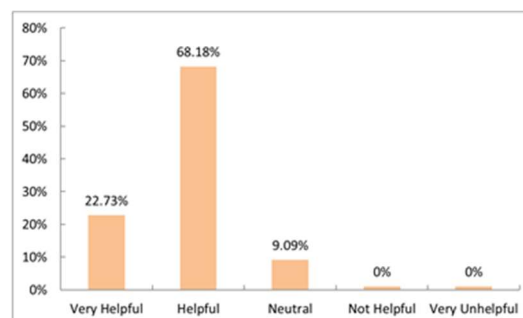


Fig.3 Degree of Assistance Provided by In-Class Quizzes in Students' Understanding and Mastery of Course Knowledge Points

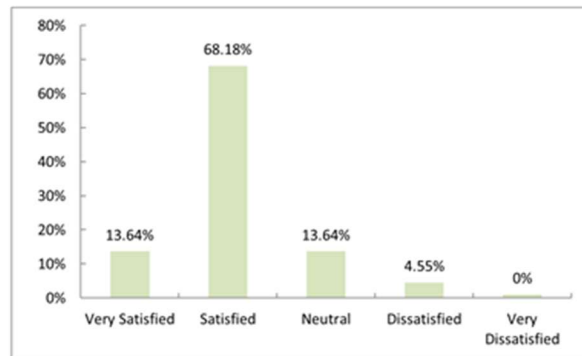


Fig. 4 Degree of Satisfaction with the Timeliness of Students' Feedback and Ratings on In-Class Quizzes

The results indicate that the vast majority of students have a positive attitude towards replacing traditional Class Summaries with In-Class Quizzes, with 13.64% of students expressing "Very Much Liked" and 63.64% of students indicating "Liked". In terms of focus, as high as 90.91% of students believe that In-Class Quizzes have enhanced their classroom concentration, with 31.82% of students feeling a "Significant Improvement". Regarding the assistance in understanding and mastering the course knowledge points, 68.18% of students find In-Class Quizzes "Helpful" and 22.73% of students find them "Very Helpful". As for the timeliness of feedback and grading on In-Class Quizzes, 81.82% of students express "Satisfaction" or "High Satisfaction". Overall, the feedback from students is positive, suggesting that the substitution of Class Summaries with In-Class Quizzes is an effective educational reform measure, conducive to enhancing the learning experience and teaching effectiveness.

3.2. Quantitative Analysis of Quiz Results

To ascertain the effectiveness of the innovation replacing Class Summaries with In-Class Quizzes in the "Medical Information Analysis and Decision Making" course, we conducted a quantitative assessment of the quiz outcomes. A total of five In-Class Quiz sessions were implemented as a substitute for Class Summaries in this course, featuring multiple-choice and true/false questions, with the number of questions determined by the time allocated for class summaries. For these five In-Class Quizzes, there were instances where students could not participate due to reasons such as leave of absence; hence, we initially filled in the missing data using the mean value method. Furthermore, considering the lack of comparability between different quizzes due to variations in difficulty, quantity, and duration, we standardized the quiz score data using the formula $x' = (x - \mu) / \sigma$, where μ represents the mean and σ the standard deviation. We then used the standardized score data to analyze the trend in students' performance, as depicted in Figure 5, which illustrates the trend in students' scores. It can be observed from Figure 5 that there is a trend of improvement in the mean scores after standardization. For the standardized scores of the five In-Class Quizzes, we calculated the quantiles and plotted the boxplot as shown in Figure 6. It can be seen from Figure 6 that the median of the first four quizzes shows an upward trend, and although the median of the fifth quiz did not increase, there is a trend of score concentration. Additionally, we analyzed the attendance data, which indicates that the attendance rate for the Information Resource Management major increased from 91% to 96% and then stabilized, while the Statistics major maintained an attendance rate above 93%, demonstrating that student engagement in class has improved and stabilized at a higher level.

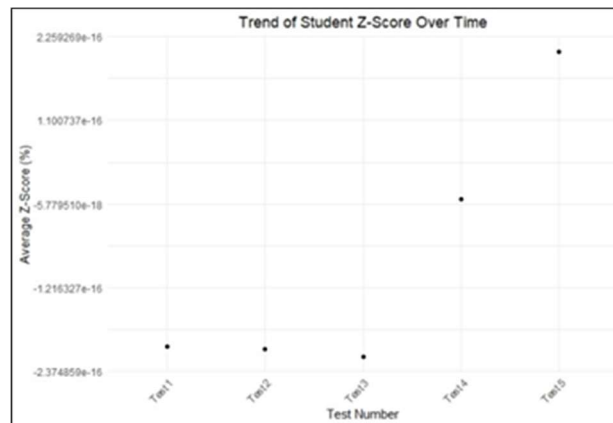


Fig. 5 Trend Chart of Mean Standardized Scores for All Students

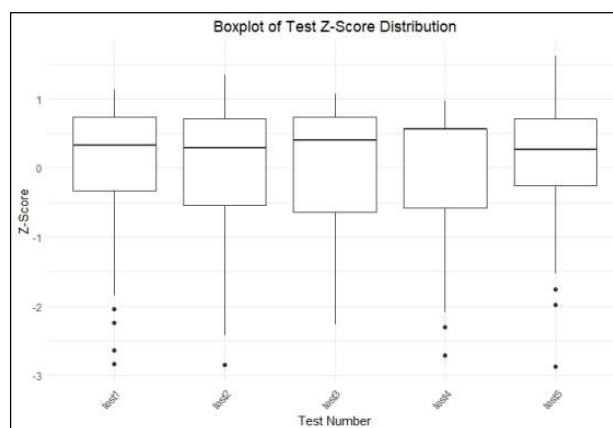


Fig. 6 Box Plots of Quantiles for Each Quizzes

4. Discussion

4.1. Immediate Feedback and Enhancement of Learning Efficiency

By leveraging the automatic grading feature of the Learning Management System platform, In-Class Quizzes provide students with immediate feedback. Students can obtain their scores and answers immediately after completing the quizzes, and this timeliness greatly facilitates their mastery of knowledge and correction of mistakes. The transparency and speed of immediate feedback effectively stimulate students' motivation to learn and their autonomy, guiding them to engage in self-reflection and learning adjustments, thereby enhancing learning efficiency without extending classroom time.

4.2. Integration of In-Class Quiz Scores and Strengthening of Learning Motivation

Integrating In-Class Quiz scores into the students' regular performance assessment system not only enhances their focus on classroom learning but also encourages their ongoing engagement with the learning process. This assessment mechanism makes it clear to students that their participation in class and performance on quizzes directly affect their final grades, thereby stimulating their concentration and enthusiasm in class without imposing additional learning burdens.

4.3. Innovation in Teaching Models and Cultivation of Autonomous Learning Skills

By replacing Class Summaries with In-Class Quizzes, without increasing classroom learning time, we have successfully enhanced students' learning engagement and knowledge acquisition

by arranging well-designed quizzes at the end of courses. This efficient substitution not only represents an innovation in teaching models but also fosters students' autonomous learning skills. Through this approach, students are encouraged to conduct in-depth reviews and explorations after class, consolidating what they have learned in class and honing their abilities to think independently and solve problems. This self-driven learning process promotes a deeper understanding of classroom materials and improves their ability to self-monitor their learning progress and identify areas where they need to improve, allowing them to take timely action to address deficiencies without extending classroom time.

4.4. Areas for Improvement and Directions for Enhancement

While the implementation of In-Class Quizzes as a substitute for Class Summaries has achieved positive results, there are still areas that require improvement.

4.4.1. Enhancing the Depth of Feedback

Although the majority of students are satisfied with the immediate feedback and grading of the In-Class Quizzes, 4.55% of students are dissatisfied with the approach of providing answers only after answering the questions. They hope to receive more detailed explanations for difficult problems. To address this need, we will provide more in-depth learning support in future teaching, including offering more comprehensive explanations for the difficult issues commonly reflected by students after the quizzes, such as additional explanatory materials, examples, or video demonstrations, to help students better understand and grasp complex concepts.

4.4.2. Verification of the Universality of Teaching Methods

The implementation of In-Class Quizzes was conducted in specific courses and among particular groups of students, which may limit the universal applicability of the research findings. To overcome this limitation, we plan to extend the method of In-Class Quizzes to more courses and student groups with different professional backgrounds to verify and enhance the broad applicability and applicability of its conclusions.

5. Conclusion

In the "Medical Information Analysis and Decision Making" course, by implementing In-Class Quizzes as a substitute for traditional Class Summaries, we have successfully explored an innovative teaching model. This transformative strategy not only enhanced students' classroom engagement and focus but also significantly improved their mastery of knowledge through the immediate feedback feature of the Learning Management System. Both the questionnaire survey and quantitative analysis indicate that students generally hold a positive attitude towards this teaching reform, believing that In-Class Quizzes help deepen their understanding of the course content. Moreover, the steady improvement in grades also demonstrates the effectiveness of the teaching method. Nevertheless, we have identified areas for improvement, including providing more in-depth feedback to address students' difficult questions and verifying the universality of teaching methods across different courses and student groups. In summary, this study provides empirical support for the innovation of teaching methods and points out the directions that need attention and optimization in future educational practices to achieve more efficient teaching and a deeper learning experience.

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