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Reform and Practice of Agricultural Machinery Test Design and Data Analysis Course based on Blue Ink Cloud Class Platform

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Abstract

In view of the current reform hotspots in blended teaching and the demand for innovative talent cultivation in agricultural engineering, this paper explores the blended teaching mode and teaching effectiveness of the agricultural machinery experimental design and data analysis courses based on the Blue Ink Cloud Class platform. By integrating students' online learning with classroom teachers' offline teaching through this platform, the pre-class exploration and guided learning during class are optimized, classroom interaction is strengthened, and the transfer and internalization of professional knowledge and practical skills are promoted. The practical effect of the reform shows that the blended teaching mode based on the Blue Ink Cloud Class platform helps further improve teaching effectiveness and quality, and it also effectively improves the practical ability of agricultural machinery related majors to use modern experimental design tools to solve complex engineering problems, cultivates more innovative engineering and technical talents to meet the current demand for new quality productivity in agriculture.

Keywords

Cloud Class; Agricultural Engineering; Blended Teaching; Teaching Quality; Talent Cultivation.

1. Introduction

The course “Agricultural Machinery Test Design and Data Analysis” is a professional elective for majors in agricultural mechanization and automation, as well as agricultural intelligent equipment engineering. It serves as a bridge from theory to practice and from foundational knowledge to specialization, significantly influencing the quality of talent cultivation in these fields [1-3]. However, for a long time, this course has been taught using traditional methods in our college, leading to unsatisfactory teaching outcomes and insufficient basic skills among students. As a result, graduates often struggle to meet the practical needs of production, R&D, and further studies in the agricultural machinery sector.

With the continuous advancement of information technology and the widespread adoption of the internet, blended teaching, which combines online learning with traditional offline instruction has become a focal point in educational reform and has begun to be applied in teaching practice [4-5]. Addressing the issues in the “Agricultural Machinery Test Design and Data Analysis” course and the needs of agricultural mechanization and intelligent agricultural

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equipment majors, this paper introduces a teaching reform supported by the Blue Ink Mobile Cloud Teaching Platform, implementing an interactive blended teaching approach to cultivate innovative and practically skilled agricultural engineering talents.

2. Overview of Blue Ink Cloud Class Platform

Blue Ink Cloud Class is a mobile teaching assistant that has become a mainstream mobile informatization teaching tool and platform in Chinese universities [5-6]. The platform features modular design including resources, members, activities, and messages. The activity module encompasses functionalities like assignments/group tasks, polls/ questionnaires, brainstorming, Q&A/discussions, and tests, providing strong support for various interactive learning scenarios such as self-study, discussion, group collaboration, work sharing, and learning evaluation.

The "class performance" module includes activities such as "raising hands," "quick response," and "group evaluation." The digital "raising hands" function mimics traditional classroom interactions but caters to students' stage fright. The "quick response" function uses an experience reward mechanism to motivate active participation, linking it to performance scores to make learning more engaging and stimulating. Blue Ink Cloud Class enables goals and effects that traditional teaching cannot achieve, providing students with a personalized learning environment where they can study anytime and anywhere, highlighting the teaching philosophy of "learn first, teach later; teach to guide learning" [7-9].

3. Strategies for Constructing Classes

The blended teaching mode supported by the Blue Ink Cloud Class platform for the agricultural machinery test design and data analysis course covers three teaching stages: pre-class exploration, guided learning during class, and post-class extension. The teaching mode framework is shown in Fig.1.

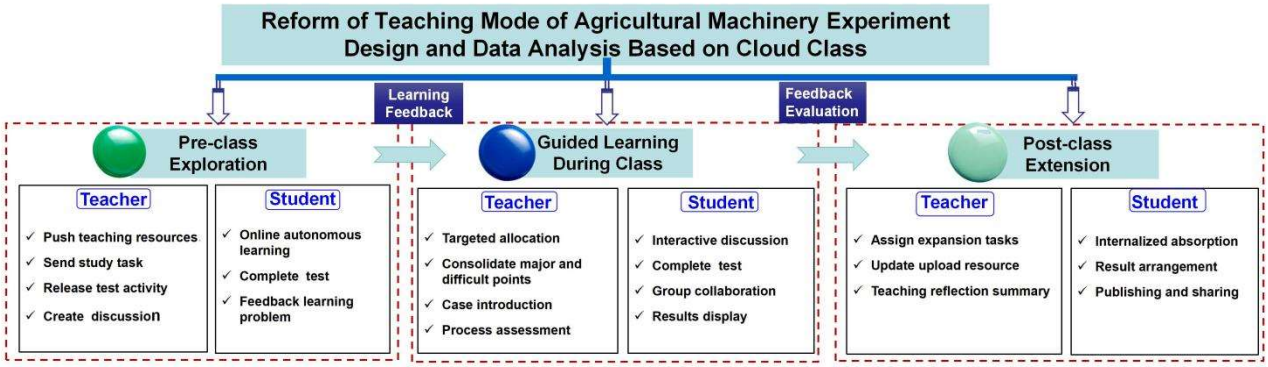

Fig. 1 Teaching Mode Framework of "Agricultural Machinery Test Design and Data Analysis" Course Reform

3.1. Pre-class Exploration

In the pre-class phase, teachers collect and integrate professional teaching resources related to agricultural machinery optimization design, such as videos, images, and PPTs, based on students' characteristics and knowledge base. These resources are released to students via the Blue Ink Cloud Class platform, accompanied by learning task lists and related tests. Teachers also create Q&A and discussion activities for students to independently complete the learning resources and test activities online. Issues or suggestions encountered during learning can be submitted to the Q&A and discussion areas, with timely teacher responses and monitoring of

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students' progress. Teachers adjust teaching content based on feedback, focusing on difficult points and using professional cases to spark students' interest.

3.2. Guided Learning During Class

During class, teachers use the Cloud Class platform for student sign-in and analysis of their pre-study status. Common issues are addressed through focused teaching, and students are divided into groups. Utilizing the brainstorming and Q&A/discussion activities on Cloud Class, teachers summarize and elevate key points and difficult concepts. Using their research and practical experience, teachers guide students through exploratory learning using methods like case introduction and project orientation. Students engage in group discussions, create experimental designs, and record and analyze experimental plans, sharing and discussing outcomes on the platform. Teachers provide feedback and encourage peer interaction to enhance learning efficiency and understanding.

3.3. Post-class Extension

Post-class, teachers assign extended learning tasks via the online Cloud Class platform to enhance students' problem-solving and comprehensive abilities. Tasks may include group assignments with self or peer evaluations, and teachers provide feedback based on task completion. Teachers also post the latest advancements in agricultural engineering, experimental design methods, and data optimization to deepen and broaden learning, aiding continuous improvement in teaching content and methods.

4. Classroom Practice

Table 1. Blended Teaching Case of "Variance Analysis of Orthogonal Experiments" Based on Cloud Class

Phase	Student Activity	Teacher Activity
First Stage: Pre-class Exploration (1 h)	(1) Based on the published ANOVA learning task list, targeted pairs Online resources for learning; (20 min) (2) Complete the tasks on the task list independently and independently; (35 min) (3) Discuss and communicate with the teacher in the platform Q&A/discussion area for the difficulties and doubts encountered in the pre-class learning process. (5 min)	(1) Push the orthogonal experiment ANOVA tutorial video and supporting reference materials and PPT; (2) Issue the learning task list: carefully study the PPT of Section 3 of Chapter 4 of the textbook "Agricultural Machinery Experiment Design", combined with the case of range analysis in chapter 1 of the textbook, carry out ANOVA calculation, compare and analyze the differences between the results of ANOVA and range analysis and the reasons for the differences; (3) Create knowledge points and interactive discussion activities, and timely push pre-class test reminder notice; (4) Timely summary of students' pre-class learning and reconstruction of teaching design.
Second Stage: Guided Learning During Class (1.5h)	(1) Listen to the teacher's summary of the important and difficult knowledge in this section; (15 min) (2) Actively participate in classroom teaching activities organized to deepen the understanding and mastery of important knowledge points; (20 min) (3) Analyze and discuss the tasks assigned by the teacher in groups of 4-5 people; (40 min) (4) Participate in interactive activities, summarize and discuss materials, and make presentations. (15 min)	(1) According to the main line of "scheme design - data analysis - result discussion", summarize the important and difficult contents of pre-class learning, consolidate the basic knowledge related to orthogonal experimental design, and use concentrated teaching to make targeted points; (2) Publish and discuss activities: What is the difference and scope of application between ANOVA and range analysis? What are the reasons for the difference between the two test methods? (3) Consolidating exercises in class with textbook cases; (4) Teaching students to develop test plans and test data analysis and calculation methods; (5) Evaluate student learning outcomes and student teaching reports.
Third Stage: Post-class Extension (1 h)	(1) Completing after-school development tasks to strengthen knowledge absorption, consolidation, and internalization; (20 min) (2) Complete the learning of resources on the new line and expand the knowledge horizon; (20 min) (3) Learning summary. (5 min)	(1) Assign extended training tasks: consult papers related to experimental design and data processing related to agricultural machinery, understand the data analysis methods used in the papers, and analyze their application scope. (2) Release the latest experimental design methods and theoretical developments to expand learning materials; (3) Carry out teaching reflection according to students' performance and systematic learning data in teaching process.

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Orthogonal experimental design is a key topic in the “Agricultural Machinery Test Design and Data Analysis” course. Taking the session “Variance Analysis of Orthogonal Experiments” as an example, the teaching activities based on this mode are shown in Table 1. This session reinforces students' design of orthogonal experiments and application of variance analysis to solve practical experimental optimization problems, understanding the methods for determining experimental conclusions. The pre-class tasks introduce students to concepts like factor levels and degrees of freedom, building on their foundational knowledge from previous courses.

5. Conclusion

Compared to traditional teaching methods, the blended teaching mode utilizing the Blue Ink Cloud Class platform leverages rich online interactive functions and offline interactive teaching, significantly enhancing student engagement and interest. Teachers can flexibly adjust teaching content based on real-time data from the platform, innovating teaching methods and reinforcing knowledge through offline discussions. The complete and detailed teaching records facilitate continuous evaluation and reflection, aiding in teaching management. Objective data from final tests indicate that students in the blended mode achieve slightly higher average scores, with more consistent performance. However, the increased intensity and requirements of online learning may slightly reduce students' motivation and interaction, affecting some learning outcomes.

In summary, the Blue Ink Cloud Class is a tool that teachers should use effectively to complement various teaching methods, tailoring to actual teaching needs. The ultimate effectiveness of course teaching depends on how well students' intrinsic motivation to learn is awakened. Future teaching processes should consider integrating multiple teaching modes and platforms, balancing their advantages to effectively enhance students' practical abilities in using modern experimental design tools to solve complex engineering problems.

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