ISSN 2522-6398 Vol. 7, Issue 8: 16-22, DOI: 10.25236/FER.2024.070803

Research on the Construction and Application of Management Platform of Micro-teaching Training Room in Colleges and Universities

Dong Dandan[1,a], Hu Zhenying[2,b,*]

[1]*Jing Hengyi College, Hangzhou Normal University, Hangzhou, Zhejiang, China*
[2]*Zhejiang Provincial Key Laboratory of Intelligent Education Technology and Application & College of Education, Zhejiang Normal University, Jinhua, Zhejiang, China*
[a]*1379142475@qq.com,* [b]*huzy@zjnu.cn*
[*]*Corresponding author*

Abstract: *Under the backdrop of the robust development of digital education, the micro-teaching training room has gradually evolved into an open and shared platform for teaching skills training. This transformation has placed more stringent demands on the functionality and efficiency of the micro-teaching management system. This paper focuses on a specific case study at a renowned teacher's college in China, conducting a deep analysis of the actual needs and challenges encountered in the daily management and application process of the smart micro-training room. Subsequently, it proposes a comprehensive and detailed solution system. The program aims to systematically address three core issues: Firstly, to enable convenient and efficient self-appointment mechanisms for all students across the school, thereby enhancing their initiative and flexibility in learning. Secondly, it seeks to provide teachers with flexible and independent curriculum arrangement functions to facilitate optimal allocation of teaching resources and personalized teaching arrangements. Lastly, it aims to enhance administrators' intelligent management capabilities by simplifying management processes through automation and intelligent means, thus improving overall efficiency and accuracy. After two consecutive academic years of practical application, this solution has demonstrated remarkable results. It not only effectively streamlines the management process within the micro-teaching practice room while reducing human errors and time costs but also significantly enhances booking efficiency as well as class scheduling - ultimately creating a smoother and more efficient teaching environment for both teachers and students alike. This practical achievement not only offers valuable insights for similar colleges or universities but also provides strong support for future developments in digital education environments regarding innovation in directionality as well as management models within micro-teaching training rooms.*

Keywords: *teacher education experimental training; intelligent micro-teaching training room; management platform*

1. Introduction

Micro-teaching, a systematic and scientific approach to developing students' teaching skills, has its roots in the principles of education, psychology, and systems science, combined with modern audiovisual equipment. It emerged from the educational reform movement in the 1960s in the United States and was pioneered by W. Allen and his colleagues at Stanford University. They built upon the "role-playing" methodology and utilized video recording technology to capture and analyze trainees' teaching sessions promptly, with the aim of accelerating their skill enhancement. This approach eventually evolved into a comprehensive Micro-teaching curriculum.

With increasing emphasis on practical teaching abilities in the job market, schools are placing greater value on these skills during recruitment. Consequently, both teachers and students are increasingly focused on honing their teaching abilities, leading to a growing willingness among students to independently book training sessions[1]. To meet this demand, 30 Micro-teaching labs have been established across two floors (15 labs per floor), as depicted in Figure 1. These labs are equipped with classroom signs, magnetic door access systems, recording and broadcasting facilities, as well as video analysis software.

ISSN 2522-6398 Vol. 7, Issue 8: 16-22, DOI: 10.25236/FER.2024.070803

However, under the current management system several significant issues hinder user experience:

Firstly, the lack of connectivity between systems complicates equipment usage procedures, making it challenging for teachers and students to monitor room availability in real-time. This leads to booking conflicts, underutilization of resources, and inefficient equipment usage, all of which have a detrimental impact on the quality and effectiveness of practical teaching. Secondly, manual bookings by administrators are inefficient, especially when catering to a large student and faculty population. This approach burdens administrators with numerous tasks, including booking management and maintenance. Additionally, manual data collection (e.g., equipment utilization, absenteeism rates) is prone to omissions and time-consuming, lacking both accuracy and efficiency[2].

Lastly, the limited capacity of each classroom, accommodating 6 to 8 individuals, complicates course scheduling. Consequently, a standard class of 35-40 students often requires five or more classrooms. Administrators must gather demands offline and manually arrange courses, involving extensive communication and coordination, significantly increasing the difficulty and workload of scheduling.

Note: 219 & 351 are teacher evaluation rooms where teachers remotely view students' practical training. 217, 214, 349, 314 are scenario simulation classrooms used for students' pre-class concentration in the micro-teaching practical training room, post-class critique, and simulated classroom training in the regular classroom prior to teaching. The remaining classrooms are Micro-teaching practical training rooms.

Figure 1: Distribution diagram of the micro-training room

In order to comprehensively enhance the service and management level of the Micro-teaching training room, the platform construction is based on existing conditions. It is oriented towards meeting the core demands of teachers and students by integrating resources and data of the training room through intelligent means. This will realize the informatization, automation, and refined management of daily operation and maintenance of the laboratory.

Simultaneously, the platform focuses on optimizing the laboratory teaching process by providing information on occupation status, facilitating booking for use, video recording through campus pegging, as well as self-reflection and enhancement through integrated video analysis tools.

On the teacher's side, this platform enables homework assignment, online marking, group mutual assessment, and online guidance with specific objectives:

1.1. Enhance intelligent management of the training room

Substantially improve intelligent management levels in practical training rooms by integrating advanced software and hardware technology to achieve precise regulation across multiple dimensions such as equipment resources, teaching activities, and environmental monitoring. This will ultimately improve efficiency in using practical training rooms while enhancing quality teaching services[3].

1.2. Develop intelligent scheduling solutions for practical courses

Considering unique scheduling needs for practical courses; utilizing intelligent algorithms and big data analysis technology to custom design a set of intelligent scheduling systems that can meet diversified course needs while maximizing utilization of training room resources - completely solving traditional scheduling problems.

ISSN 2522-6398 Vol. 7, Issue 8: 16-22, DOI: 10.25236/FER.2024.070803

1.3. Establish a unified and efficient reservation mechanism for teacher training students across the entire university.

The goal is to create a centralized, user-friendly, and transparent reservation platform for all teacher training students at the university. By implementing comprehensive authority management and reservation rules, we aim to ensure that every teacher training student can easily and efficiently reserve the necessary resources in the training rooms at any time and from any location. This will effectively address scheduling conflicts between faculties, departments, and majors.The overall system architecture is depicted in Figure 2.

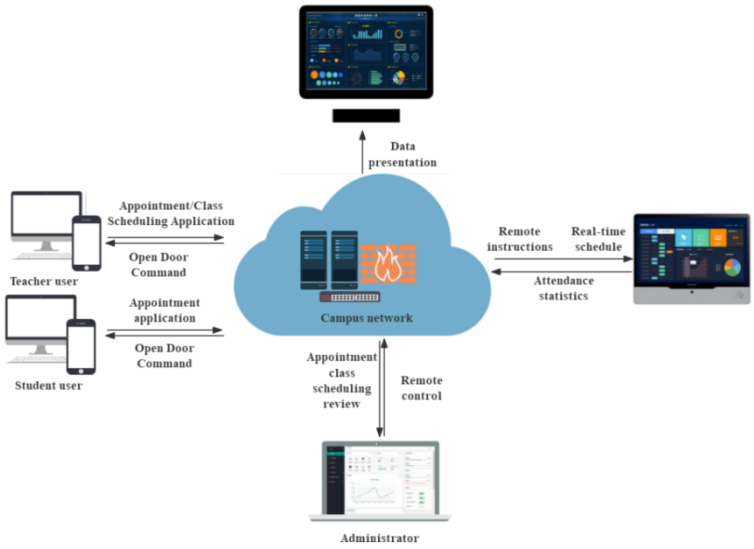

Figure 2: System Architecture

2. System Architecture and Functions

This paper aims to develop an intelligent and automated micro-teaching training room management platform to enhance the efficiency of practical training teaching and improve the experience of both teachers and students.

2.1. Overall Architecture

The intelligent Micro-teaching training room management platform embraces a B/S architecture, incorporating cutting-edge technologies to foster a highly efficient and intelligent teaching management environment. With regard to system design, we have delicately crafted the interaction process between the classroom and user ends. Devices are interconnected via IoT protocols, facilitating real-time data transmission, while HTTP protocols enable users to effortlessly operate through the campus pinning application for booking and scheduling functions.

The platform encompasses various functional modules, including basic data management, appointment scheduling, online class sessions, operation logs, and a large data screen. Regarding database design, we have crafted a meticulous table structure comprising user tables, training room tables, reservation tables, scheduling tables, log tables, video tables, assignment tables, and more. This ensures the integrity, consistency, and security of the data[4].

The platform's development environment harnesses the strengths of three programming languages: PHP, Java, and Python, along with MySQL databases, to enhance development efficiency and system performance. Moreover, in the implementation of key technologies, we have adopted multiple verification mechanisms to safeguard account security and utilized intelligent algorithms to optimize resource allocation.

ISSN 2522-6398 Vol. 7, Issue 8: 16-22, DOI: 10.25236/FER.2024.070803

2.2. System Functional Design

The system design thoroughly considers the role characteristics and functional needs of various types of users within the training venue. It subdivides the core business processes of the integrated management platform into three major modules: exclusive functional areas for student users, teacher users, and administrator users. This division aims to meet the unique needs of different user groups while ensuring comprehensiveness and relevance in platform functions.

2.2.1. Student users

As the main participants in practical training, student users primarily require booking, inquiry, and access to results. The system allows students to instantly check room occupancy status for practical training sessions through Campus Nail's "Micro-teaching Teaching" application and book sessions flexibly according to their personal study schedules. The inquiry function enables students to track their personal training schedule, progress, and completed tasks in real time for effective learning process management. Additionally, result release services allow students convenient access to individual scores and reviews so they can adjust their learning strategies for self-improvement[5].

2.2.2. Teacher Users

As the organizers and instructors of practical training activities, the needs of teacher users are intricate and multifaceted. The system supports teachers in carrying out intelligent scheduling based on course design and practical training resource allocation, as well as scientific planning of students' practical training schedule. Teachers can utilize the course management module to publish course overviews, set learning objectives, and upload supplementary teaching materials to ensure transparency and accessibility of teaching content. At the class management level, the system enables teachers to monitor students' progress in practical training and homework submission, facilitating timely feedback and personalized guidance. Additionally, the integrated grade entry system simplifies grade management processes while the built-in online guidance tool facilitates instant communication between teachers and students to meet demands for personalized teaching guidance.

2.2.3. Administrator User

As the maintainer and manager of the entire platform, the administrator user bears an important responsibility for ensuring stable system operation and data protection. Through the management background, administrators can perform full-cycle management of user accounts including account creation, editing, deletion, as well as fine control of each user's permissions and role assignments to ensure system information security. Simultaneously conducting regular data backup and recovery work is essential to prevent data loss or damage. Furthermore, administrators also need to monitor real-time system operation status in order to identify potential problems or failures promptly so as to ensure stability and reliability of the platform.

3. Key Process Design

3.1. Student Reservation Process Design

The process of students booking the Micro-teaching training room is seamlessly implemented through the campus pinning micro-portal. The booking process requires students to fill in detailed booking information, including the booking time, classroom usage, expected number of participants, specific usage time, and preferred floor (see Figure 3). The system then presents the current occupancy status of the training room at the selected location for the student to select and submit a reservation request. The administrator reviews the booking information and either approves it or rejects it based on compliance with borrowing rules. If approved, a notification with the booking details (time, location, and access code) will be sent to the student; if rejected, the student must adjust their booking information accordingly and resubmit.

The carefully designed booking rules ensure that as many students as possible have access to practical training opportunities by allowing bookings up to two days in advance while limiting each person to only two sessions per day. This strategy aims to achieve fair and efficient allocation of practical training resources while motivating students to value these opportunities and reducing failure rates effectively.

ISSN 2522-6398 Vol. 7, Issue 8: 16-22, DOI: 10.25236/FER.2024.070803

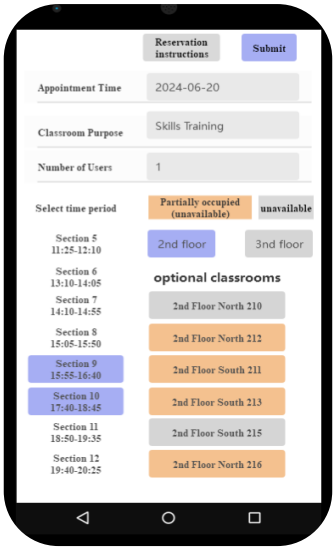

Figure 3: Micro-teaching Reservation Interface

3.2. Teacher scheduling process design

The teacher scheduling function is designed to prioritize efficiency and flexibility. During the scheduling process, teachers should input the number of students in their class and select the desired date (e.g., Wednesday of the week). The system will then recommend an appropriate classroom capacity based on the class size provided and determine the current number of teaching weeks that can be scheduled[6].

For example, if a class has 32 students and the teacher wishes to teach on Wednesday mornings from 3rd to 5th period, the system will filter feasible teaching weeks based on the availability of Micro-teaching classrooms. If these options meet the teacher's requirements, they can confirm their choice directly from available teaching weeks; if not, they can adjust parameters such as classroom size, time of day or number of sessions, as shown in Figure 4.

Once a final selection is made and confirmed by the teacher, the system will automatically generate a semester schedule and send it to their personal background. The scheduling mechanism follows a "first-come, first-served" principle where once a time slot is selected, it becomes unavailable for other teachers. This reduces unnecessary communication between teachers and administrators.

Teachers needing to make adjustments to their scheduled classes can submit change requests with reasons directly in the system and await administrator review. The classroom allocation strategy prioritizes proximity by considering neighboring classrooms on same or cross floors in order to improve scheduling efficiency and ensure smooth progress of teaching activities.

Class Scheduling Time: 2024-09-01-2025-01-13 **Confirm**
Course Scheduling Teacher:Ms. Dong
Number of class:32
Day of the week:Wednesday

Section 1	8:05-8:50					
Section 2	8:50-9:35					
Section 3	9:45-10:30	week1 2024-09-04	week 2 2024-09-11	week 3 2024-09-18	week 4 2024-09-25	week 5 2024-10-02	week 6 2024-10-09
Section 4	10:40-11:25						
Section 5	11:25-12:10						
...	...	week 7 2024-10-16	week 8 2024-10-23	week 9 2024-10-30	week 10 2024-11-06	week 11 2024-11-13	week 12 2024-11-20
Section 11	18:50-19:35	week13 2024-11-27	week14 2024-12-04	week15 2024-12-11	week16 2024-12-18	week 17 2024-12-25	week 18 2025-01-01
Section 12	19:40-20:25						

Figure 4: Teacher scheduling interface

ISSN 2522-6398 Vol. 7, Issue 8: 16-22, DOI: 10.25236/FER.2024.070803

3.3. Design of Class Schedule Display

From the end of the previous semester to the beginning of the new semester, the administrator grants scheduling privileges to all school teachers, who create a preliminary class schedule based on their practical teaching plans. Once the school year begins, students are given booking privileges, allowing them to make reservations two days in advance or on a temporary basis. Upon approval of reservation applications, the class schedule is updated in real time[7]. The administrator can then generate today's and this week's class schedules for convenient real-time viewing, enabling accurate management of training room reservations and usage. Additionally, new reservation information is synchronized with the electronic class board at the training room entrance to display today's and tomorrow's schedules, facilitating timely awareness for teachers and students and ensuring orderly teaching and learning. *Figure 5* presents today's class schedule information in red for scheduling details and yellow for student reservations within the administrator's backstage.

Today's Schedule|This week's class schedule				Previous Day|Today|Next Day	
Classroom	Section I	Section 2	...	Section 11	Section 12
	8:05-8:50	8:50-9:35	...	18:50-19：35	19:40-20：25
210	Simulated Class Hua Bicen	Basic Skills for English Teachers Mr Zhang	...	Lecture Presentation Li Jiayi	Micro-teaching Recording Yang Lixue
212	Micro-teaching Recording Zhang Yiran	Basic Skills for English Teachers Mr Zhang	...	Simulated Class Xu Qianhui	Lecture Presentation Xue Ziyu
214	Simulation class Li Yuchen	Basic Skills for English Teachers Mr Zhang	...	Micro-teaching Recording Zhou Jieyang	Lecture Presentation Chen Siyu
...	...	...	...	...	...
343	...	...	...	...	...
345	...	...	...	...	...

Figure 5: Today's class schedule for administrators

4. Application Effectiveness

The system administrators were able to continuously monitor the daily lectures and appointments in the training room with real-time updates of the daily timetable. By conducting in-depth mining and analysis of accumulated student booking data, the system can provide insights into students' booking habits and popular time slots, which helps in making reasonable planning and resource deployment in advance.

Furthermore, the system significantly streamlines the booking process for students' practical training rooms. Over the past two years, more than 30,000 online booking operations have been completed. This not only simplifies the booking procedures for students and reduces the workload of classroom managers but also ensures that booking records leave traces throughout the entire process, making them easy to trace and manage.

In addition, through its statistical report function module, the system efficiently captures and integrates a large amount of data. This provides teaching departments with quick report generation capabilities as well as in-depth analysis of data, strongly supporting decision-making for teaching management and quantitative assessment of teaching results.

Regarding teacher-student satisfaction surveys, it is widely recognized that as many as 92.86% of students consider online booking methods to be more convenient than traditional methods. The survey also reflects new demand trends such as students' strong desire for training rooms to be open on weekends and holidays. In response to this feedback, the system has developed a function to open classrooms on weekends and will gradually expand access on non-working days when subsequent management conditions allow it so as to meet growing demand from students for independent practice opportunities.

ISSN 2522-6398 Vol. 7, Issue 8: 16-22, DOI: 10.25236/FER.2024.070803

5. Conclusion

In conclusion, the Micro-teaching Training Room Management Platform has successfully addressed challenges related to practical course scheduling, teacher-student reservation, and intelligent management, thereby significantly enhancing the efficiency of training room management. Through continuous optimization and iteration, this platform has evolved into not just a management tool, but a vital bridge connecting administrators, teachers, and students, effectively fostering communication and collaboration among them. While achieving noteworthy outcomes, we remain vigilant in monitoring the satisfaction of teachers and students, diligently identifying their emerging needs, and making timely adjustments and improvements. Together, we strive to steer the Micro-teaching training room towards greater openness, efficiency, sharing, and intelligence.

References

[1] Maguire Kelly R.Pre-service teachers' reflections on content knowledge through microteaching. [J]. Reflective Practice. Volume 24, Issue 2 . 2023. PP 153-167.

[2] Lefebvre, Armel; Spruit, Marco. Laboratory Forensics for Open Science Readiness: an Investigative Approach to Research Data Management [J] Information Systems Frontiers. Volume 25, Issue 1. 2021. PP 1-19.

[3] Liang Caizhi. Open Sharing Management of Artificial Intelligence Laboratory Based on Deep Fusion of Big Dats. [J]. Wireless Communications and Mobile Computing. Volume 2022, 2022.

[4] He Yongqin; Duan Jingjing; Chen Qian; Guo Xiaoling.Exploration and practice on the opening and sharing management mode of undergraduate experimental teaching instruments and laboratory information management system (LIMS) under the background of "Double first-class".[J] Chinese journal of biotechnology. Volume 37, Issue 9. 2021. PP 3361-3367.

[5] Jin Liu;Gang Ding;Peng Lin.Design and Implement of Open Laboratory Management System.[J] Applied Mechanics and Materials. Volume 2594, Issue 373-375. 2013. PP 1661-1664.

[6] Lijian Xiao;Pratik J. Parikh;Xinhui Zhang.Course scheduling problem with cohort group and room considerations.[J] International Journal of Industrial and Systems Engineering. Volume 45, Issue 4. 2023. PP 458-483.

[7] Mi Lan. The Outline Design of Students' Schedule Management System Based on B/S Mode.[J] MATEC Web of Conferences. Volume 44, Issue. 2016. PP 02055.