

Design and Implementation of Classroom Attendance Management System for Vocational College Students Based on WeChat Mini Program

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Abstract—According to the current actual situation of students' class attendance in higher vocational colleges, this paper reasonably points out the characteristics and requirements of the system. It puts forward the overall design framework of the system. Design the architecture scheme to guide the system architecture scheme for the follow-up design of the classroom attendance management system for students in higher vocational colleges. The classroom attendance management system for students in higher vocational colleges can facilitate the management of student classroom attendance by counsellors and teachers in higher vocational colleges, improve the work efficiency of academic management departments, and accelerate the modernization of management in higher vocational colleges.

Keywords: WeChat applet; Attendance check-in system; Design and Function; management system;

1 INTRODUCTION

With the rapid development of the Internet and the continuous improvement of network speed, more and more transaction processing is transferred to the mobile terminal. As the protagonist of the mobile terminal, mobile phones are playing an increasingly important role. Through the investigation of college students and the author's own experience, we can find that the attendance-checking methods of university teachers are relatively traditional, and there have been some fresh attempts. Still, they have yet to be implemented on a large scale. Improve. However, attendance status can be used as a reference for teaching quality and has a supervisory effect on students' learning. Hence, an efficient attendance method is essential [1]. Considering that most students use smartphones every day, if attendance can be combined with smartphones, it will undoubtedly significantly reduce the pressure on students' daily attendance in the classroom and improve the work efficiency of teachers [2].

This study aims at the current classroom attendance management needs of students in higher vocational colleges by developing a product for the attendance system of colleges and universities. It reasonably proposes a design framework for the class attendance management

system of students in higher vocational colleges, which will be able to provide future higher vocational education. It provides a theoretical reference for designing and optimizing the student attendance management system in colleges and universities. The classroom attendance management system for students in higher vocational colleges will further optimize student attendance management by counsellors and teachers in higher vocational colleges, improve the work efficiency of the student management department, and accelerate the modernization of the daily management of students in higher vocational colleges.[3] It plays an essential role in the management of students in vocational colleges. Therefore, this study has specific theoretical value and application values.

2 SYSTEM REQUIREMENTS ANALYSIS

2.1 Analysis of requirements and functional modules

To better design the attendance check-in system, questionnaires and interviews were used to investigate the needs of students and teachers. For students, in addition to being able to sign in, they must also be able to view their attendance records; for teachers, in addition to being able to view the time and location of attendance, they must also be able to maintain attendance information [3].

In addition, based on the needs of students and teachers, the author analyses the roles and functional modules involved in the attendance check-in system [4]. User roles are divided into student users and teacher users. After the student user clicks "sign in" or "ask for leave", the system will display whether the sign-in or leave is successful [11]. At the same time, students can also view the check-in records for a certain period (from the last one week to the previous six months). The teacher user mainly has four functions: one is to view the attendance function. After selecting the corresponding course and class, the system jumps to the attendance statistics page and displays the attendance results; the other is to view the attendance statistics function; user can view the latest Attendance record information from 1 week to the last six months (students' absences, leave requests, etc.); third, to change the attendance status of some students; fourth, to realize the functions of adding courses and deleting courses. The functional diagram is shown in Figure 1.

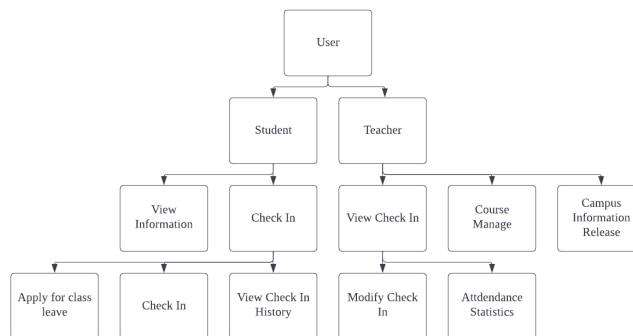


Figure1. System function structure diagram

2.2 Overall System Analysis

The mini-program is used for class attendance in colleges and universities. The user enters the mini-program from WeChat to obtain the current user's information. When registering, the WeChat ID is uniquely bound to the student or job number [6]. After logging in, the user name is used to determine whether it is a teacher or a student. To display a different interface. After entering the system, you can use campus information, class check-in, and class schedule viewing. Teachers can also see the processed statistics after the check-in is over. The system use case diagram is shown in Figure 2.

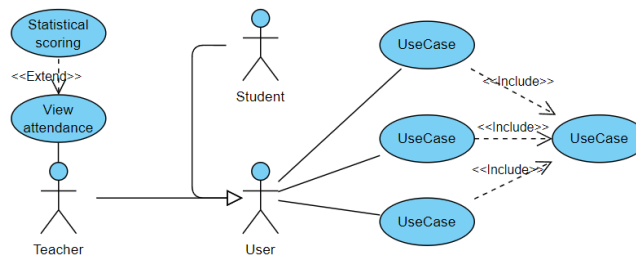


Figure 2. Use case diagram

2.3 Demand Analysis

The analysis of system function requirements determined that the attendance management system should have five basic functional modules, including attendance management, student management, user management, data management, and environment settings. The specific functions are as follows:

- (1) Attendance management module: This module is mainly for counsellors and teachers. Counsellors and teachers can add, delete, search and modify students' attendance information through this module.
- (2) Student management module: This module is mainly for counsellors and teachers, and counsellors and teachers manage student information through this module.
- (3) User management module: This module is for system administrators, who can manage user information through this module.
- (4) Environmental management module: This module is oriented toward counsellors and teachers. Counsellors and teachers can add, delete, modify and check the relevant information on students' attendance through this module.
- (5) Data management module: This module is aimed at system administrators, and its main functions include the "recycle bin" function and other functions.

2.4 System module analysis

The functional relationship of the system is shown in Figure 3 below.

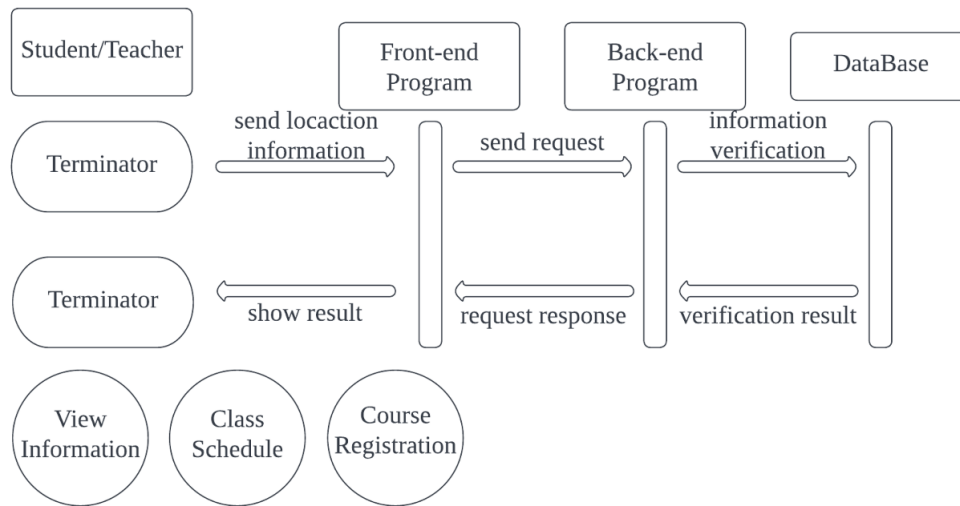


Figure 3. System function diagram

Based on Figure 3, the system functions has been divided into the following five categories:

- Register. The registration will associate the personal student number with the WeChat ID, which will play a certain role in preventing cheating. When the user signs in, he can only use the associated registered WeChat ID to be valid. That is, when he does not log in with the bound WeChat ID, the attendance check operation cannot be performed. The teacher registers with the employee number, the student registers with the student number, generates a unique association, and saves it in the database.
- Login. Enter the Mini Program from the associated registered WeChat, and log in with your student ID or employee ID and password. WeChat login for non-associated registration is invalid.
- News. Display campus information, notifications, etc., and enrich the functions of the mini-program.
- Check-in. When the teacher has an attendance requirement, he clicks on the sign-in, uploads his location information to the server, and activates the timer at the same time, and the students need to complete the sign-in within one minute to be considered valid. After the student logs in successfully, click the corresponding button to sign in. At the same time, the personal information and location information are uploaded to the server and compared with the teacher's location information. It is considered to be an effective operation within a certain range, otherwise, it will be included in the final statistical table Shows that the user's location is suspicious as shown in Figure 4.

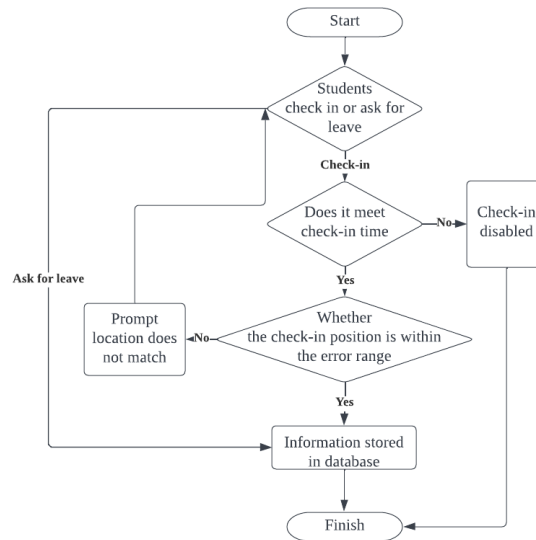


Figure 4. Student sign-in module flow chart

- The results show. After the timer ends, the server compares the information. It pushes the basic information statistics of the class to the teacher, including the total number of people in the class, how many people have successfully signed in, who is out of range, and who have not signed in. Teachers can conduct spot checks based on the final statistical information to improve accuracy as shown in Figure 5.

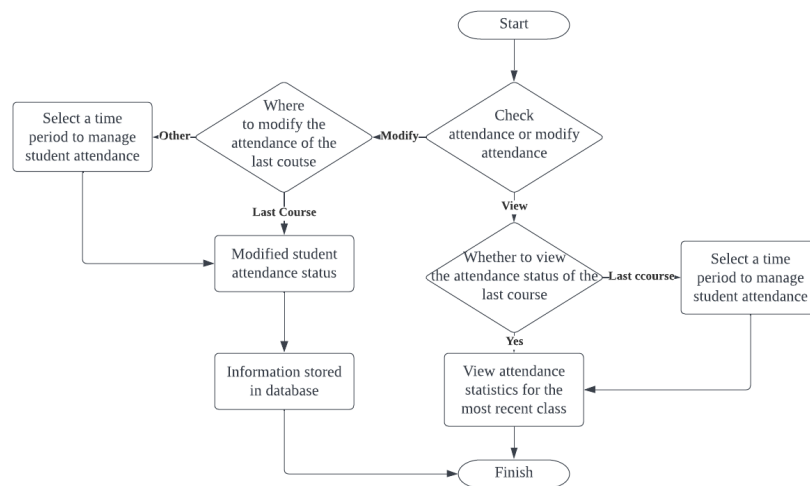


Figure 5. View check-in flow chart

3 SYSTEM DESIGN

The system adopts B/S architecture and is based on the WeChat client. Various operation requests are issued, and some core data comparisons are concentrated on the server [7]. Database operation is an important part of the system. There are many database operations in the process of system implementation. Reasonable database operations can greatly improve the speed and quality of the system. At the same time, it is also related to the accuracy of the feedback information obtained by teachers.

3.1 Client Interface Design

In client interface design. This study is divided into the following 7 pages according to the functional modules as shown in Figure 6.

- Registration interface design. The WeChat information of the current user is obtained during the initialization process of the applet. During the registration process, the student number or work number is used as the account number. If the registration is successful, the WeChat ID will be bound to the user. After that, only through Check in with this WeChat ID, otherwise the check in will be invalid.
- Login interface design. Enter the student number or job number and password to log in successfully.
- Home design. Added school information and some information about college students to enrich the functions of the Mini Program.
- Class attendance interface design. Call the GPS of the mobile phone through WeChat to obtain the location information. Teachers and students will check in according to the current class. At the same time, they will monitor the system clock to judge whether the click button is in the corresponding time period. If it is not in the specified time period, check in as invalid.
- Student information return interface. After punching in successfully, this interface will be displayed to show that punching in is successful.
- Teacher information returns to the interface. After the specified time is over, the teacher will receive a statistical information table including class, course, how many people should be there, how many people are actually there, how many people are not signed in, and students with suspicious positions. The teacher can proceed to the next step according to the returned information sheet.
- User-centric design. After logging in, you can check your class attendance status, and class schedule, and give feedback on questions.



Figure 6. System main interface design diagram

3.2 Database Design

This system adopts mongoDB database, and there are 6 main tables, which are teacher information table (teacher table), student information table (student table), class information table (class table), course information table (course table), class schedule (time table) table and sign-in information table (register table), the data relationship is shown in Figure 7.

- Teacher information table (teacher table): The `_id` automatically generated by the database is used as the primary key, including the teacher's OpenID and the teacher's name `teacher_name`.
- Class information table (class table): The `_id` automatically generated by the database is used as the primary key, including the class name `class_name`.
- Student information table (student table): Use the `_id` automatically generated by the database as the primary key, including the student's openid, student name `student_name` and class number `class_id` (establish a foreign key association with the `_id` in the class table).
- Course information table (course table): The `_id` automatically generated by the database is used as the primary key, including the course name `course_name`, the teacher's openid (establishing a foreign key association with the openid in the teacher table), the course location `course_loc` and the class number `class_id` (Establish a foreign key association with `_id` in the class table).
- Class schedule (time table): The `_id` automatically generated by the database is used as the primary key, including the course number `course_id` (establishing a foreign key association with the `_id` in the course table) and the teaching time `time_arrangement`.
- Sign-in information table (register table): use the `_id` automatically generated by the database as the primary key, including the student's openid (establish a foreign key association with the openid in the student table), course number `course_id` (establish a foreign key with the `_id` in the course table Association), class time number `time_id` and check-in status `register_status`.

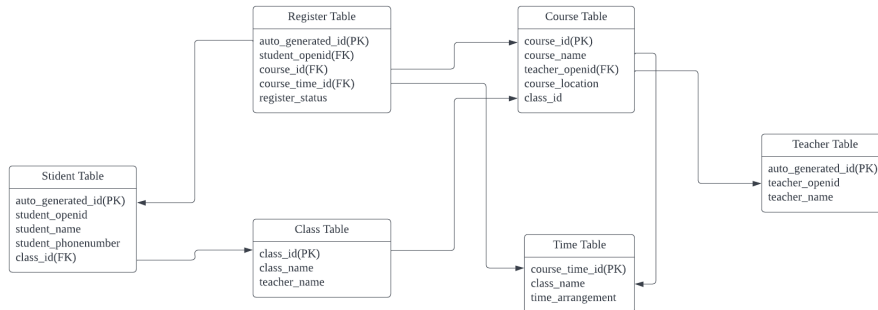


Figure7. The main data relationship of the database

In a database, there are one-to-one, one-to-many, many-to-one, and many-to-many relationships between data in tables. The following is an explanation of the more difficult to understand one-to-many and many-to-many. There is a one-to-many relationship between teachers and courses, which means that one teacher can open multiple courses, and various teachers can also open the same course, but the course numbers are different. There is a many-to-many relationship between students and courses. That is, multiple students can select one course and choose various courses at the same time, but the OpenID of a classmate and the course number of a course are listed in the course information table. There can only be one record.

4 DEVELOPMENT

4.1 User registration and login module

Before using the Mini Program, any user must register or log in according to the user type and enter the student module or teacher module. If it is the first time to log in, the user's mobile phone address, WeChat user's unique logo (OpenID) and account information are bound together [8].

Suppose it is not the first time to log in. In that case, the system will compare the mobile phone address, the unique logo of the WeChat user and the account information with the database and jump to the student module or teacher module after the comparison is successful. The advantage of this is to avoid the situation where one mobile phone logs in to multiple WeChat accounts and one person replaces various people to sign in [10].

```

// User login Get OpenId
const userLogin = async () => {
  return await Taro.login({
    success(result: Taro.login.SuccessCallbackResult) {
      // Successful login returns user information
      return Promise.resolve(result);
    }
  });
}
  
```



```
    },  
    fail() {  
      // Returns false if the user is not logged in  
      return Promise.reject(false);  
    },  
  });  
};
```

4.2 Teacher registration and login module

The main functions of the teacher user are to create classes, generate course QR codes, check attendance status, and mark students who ask for leave or are late.

4.3 Attendance check module

After successful sign-in, you can check the personal attendance status. After the students log in to the system, they check their personal information, including time, student number, name, course, teacher, etc., and the program can also detect whether the student scans the code to sign in within the specified geographical range. On the interface, there are also buttons for "Logout" and "View Attendance" [9]. Then clicking "Logout", you will log out of the current account. If you click "View Check-in Status", you can check the check-in status of this course.

4.4 Information viewing and other functional modules

Other modules are mainly for information viewing, and do not require students to log in forcibly

5 CONCLUSION

This research designed an attendance system based on WeChat applets, which solved the pain points of slow attendance and poor results in traditional class attendance. Through this system, the efficiency of class attendance can be improved and unnecessary time wasted. More can be added on this basis in future functions to meet other problems of students and teachers in their daily study life.

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