

MOOD: A Mobile Phone-enabled Educational Data Collection Platform

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Abstract: Formative evaluation is an indispensable way to evaluate students and teachers. However, it is difficult to collect classroom behaviors of students and teachers. To deal with this issue, this paper focuses on the design of the mobile teaching platform integrating into the WeChat. We develop the MOOD, a mobile phone-enabled educational data collection APP. MOOD mainly includes digital check-in, homework assignments, online testing, topic discussion, shared library, classroom performance and other modules, so it can collect data and calculate the daily scores of students automatically and scientifically, which enlarges its application area. It is not only beneficial to evaluate students and teachers formatively, but also provides a decision-making reference for the educational administrators.

Keywords: Formative evaluation, mobile teaching platform, crowd sensing

1. Introduction

Formative evaluation is a very important method in education and teaching (Bloom, 1971), which aims to improve the teaching and learning by providing teachers and learners with immediate and effective feedback (Dixson & Worrell, 2016). It is a developmental evaluation based on the continuous observation, recording and reflection of the whole learning process, which makes the students change from passive acceptance evaluation to the initiative participants of evaluation. Besides, formative evaluation helps students break the cognition that the score is the only criterion for learning. The final exam is no longer the only standard to evaluate students' achievement (Yao, 2015). This enables the teacher to understand the student's learning situation fully and discover the problems timely in the teaching process, so that the teacher can obtain continuous feedback in the teaching process (Curry, Mwavita, Holter, & Harris, 2016). Therefore, more and more people pay more attention to formative evaluation and actively carry out formative evaluation in practice.

One key issue in formative evaluation is how to collect the educational data especially the behavioral data of students and teachers. A general way is the questionnaire. However, it is high cost and low efficiency. Moreover, it is difficult to collect procedural data. Crowd sensing or mobile sensing

(Ma, H., Zhao, D., & Yuan, P., 2014) is a new paradigm in pervasive computing, where the owner of a portable device (such as a mobile phone) can be regarded as a sensing source. Mobile teaching platform integrating crowd sensing is an effective tool to implement formative evaluation in colleges. It fits well with the school-running philosophy that everyone can learn anytime and anywhere, and it adapts to new changes of continuous innovation and reform in demand for education. For example, teachers can ask questions and students race to be the first to answer a question. After that, teachers mark stars for the student. In the above process, both teachers and students are viewed as sensors.

Although there are some mobile teaching platforms, it is not used in the campus widely. The existing mobile teaching platforms also have some limitations. Most of them focus on the pushing or sharing of teaching resources and fail to collect classroom behaviors of students and teachers. Therefore, it is difficult to acquire the learning situation of students accurately. Students' learning results cannot be feedback timely. Since process evaluation is an important part of education and teaching, it is necessary to study and design a mobile teaching platform, which not only facilitates the implementation of formative evaluation, but also provides decision-making reference for the educational administrators.

In this paper, we conduct learning and teaching management on the mobile teaching platform. The proposed platform is based on the mobile terminal and is generated by the WeChat public account. Different from traditional platforms, it can collect students' classroom behaviors for formative evaluation and accumulate the data generated in education and teaching to meet the various needs of learning and interaction by being integrated into WeChat. What's more, our proposed mobile teaching platform has been put into use, which makes the theory into practice.

2. Related Work

In 1994, researchers have studied mobile education, mainly in economically developed countries such as Europe and the United States (Churchill, D., & Churchill, N., 2008). Blackboard Mobile (Kinash, & Mathew, 2012) is a smart terminal-based mobile learning platform developed by Blackboard Company of the United States. Relying on the powerful features of Blackboard Learn, Blackboard Mobile can teach and learn anytime, anywhere, and supports smart terminals currently such as iOS, Android, webOS and other operating systems. Jorge Villalon designed a collaborative marking platform in (Villalon, 2019) to support summative and formative feedback in higher education, which includes modules for printing management, scanning support, on-screen-marking, markers training and peer reviews by students. The study of mobile learning in China began with a report by Dr. Desmond Keegan, a famous international distance educator, at the 40th anniversary of Shanghai TV University (Keegan, 2003). Subsequently, China has carried out a lot of research on mobile learning and its application. In 2013, MOOC entered China as a large-scale online platform. The diversification of curriculum resources and the autonomy of curriculum participation provided a good learning environment for students. The effective teaching evaluation cannot be done through MOOC platform, and the subjective content of students' emotions or thinking ability is difficult to reflect (Zhou, P., 2016). For example, in (Yu, J., 2018), the authors proposed a SPOC (Small Private Online Course) platform based on the MOOC concept. This platform can analyze the frequency and residence time of students' online learning, but cannot be applied to the teaching and management in the classroom, since the classroom behaviors of students and teachers cannot be collected. In (Li, J., & Qiu, H., 2016), the mobile teaching platform is designed based on the mobile phone APP. Compared with the mobile teaching platform integrated into WeChat, the cost is higher, students need to install the APP, it is not

conducive to mass promotion, and the platform cannot collect student learning behavior data, so it cannot conduct formative evaluation.

Through research and comparison, some main problems existing in the development of mobile learning platforms at home and abroad. For example, the interaction design is simple relatively, and it is difficult to meet the various needs of interaction for learners in the mobile learning process. It can't be combined the characteristics at the same time such as low-cost, ultra-lightweight, and formative evaluation. Therefore, we need further research on the mobile teaching platform to improve its management functions, especially in the collection of students' behaviors for formative evaluation.

3. System Design

3.1 Framework Design of Mobile Teaching Platform

MOOD is a mobile teaching software based on WeChat development, covering all three situations before, during and after the class. It adopts the micro service architecture design concept (Zheng, Z., Cheng, J., & Peng, J., 2015) to meet the functional requirements of the mobile teaching platform. The core idea of micro service architecture design is to disassemble complex application systems into specific services of multiple independent business units. Each service is implemented with the most suitable technology and runs independently, thus applications which are easy to expand and suitable for mobile terminals are generated. In addition, each service implements a complete application, which has an independent development, deployment and operation. These features assure a high scalability and low coupling. The architecture of the mobile teaching platform is shown in Figure 1. It consists the following layers.

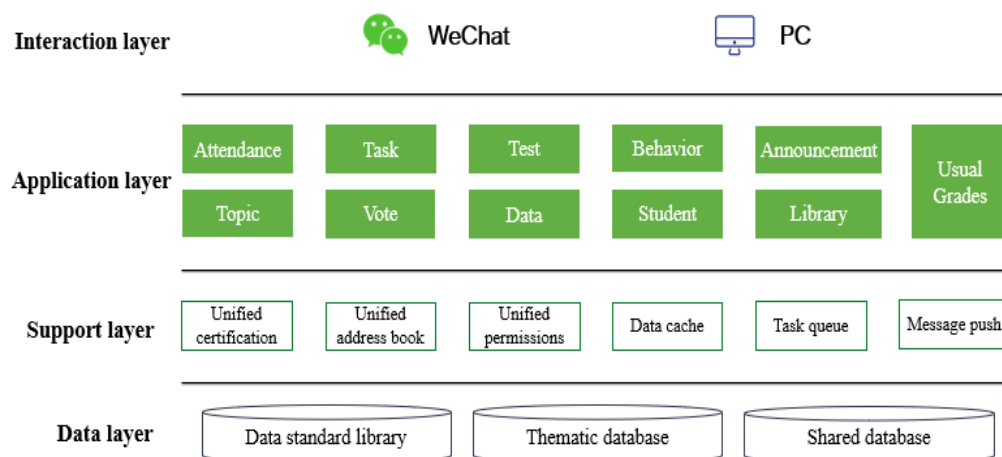


Figure 1. System Architecture

- **Interaction layer:** The mobile teaching platform supports the login by WeChat and PC, allowing students to use the mobile terminal to learn anytime and anywhere.
- **Application layer:** It consists of multiple independent services, and has multiple function modules such as check-in, operation, test, performance, etc.

- Support layer: As an integrated environment for information, it can aggregate distributed applications and information resources. It also realizes seamless access and integration of various application systems. In addition, it provides an integrated environment that supports access, delivery, and collaboration of information.
- Data layer: The data layer is divided into data standard library, special database and shared database. It not only has powerful test database resources, but also enables online testing at any time.

3.2 Function Design of Mobile Teaching Platform

The mobile teaching platform is divided into two parts: the student and the teacher. Students and teachers have the same functional modules such as check-in, homework, test, library, and grade. Through the student terminal, students can conduct related course learning, access to platform learning resources, sign on the platform, submit assignments and participate in topic discussions. Teachers use the platform to achieve course teaching, share learning materials, have an attendance checking and a classroom testing and arrange some assignments. The main interface of the mobile teaching platform is shown in Figure 2. The specific functions are as follows:

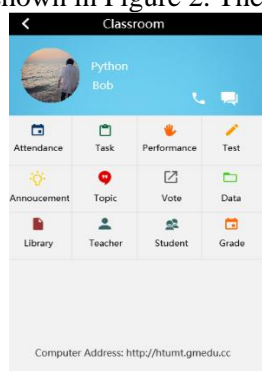


Figure 2. The Main Interface of the MOOD

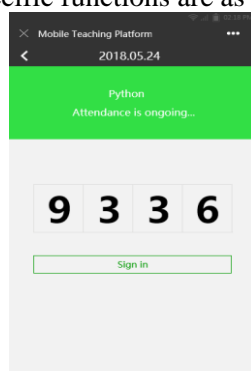


Figure 3. Digital Attendance

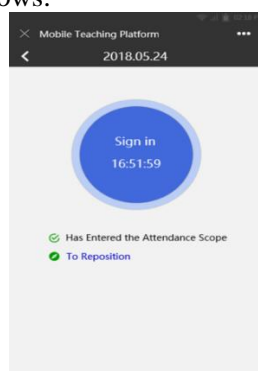


Figure 4. GPS Attendance



Figure 5. QR Code Attendance

3.3 Student Terminal

- Attendance: Students can sign on the platform according to the teacher's attendance method, after they log into the mobile teaching platform on the mobile phone. The attendance mode includes: (a) Traditional Attendance; (b) Digital Attendance as shown in Figure 3; (c) GPS Attendance as shown in Figure 4; (d) QR Code Attendance as shown in Figure 5.
- Job Submission: The mobile teaching platform supports students to submit pdf, word, excel, ppt and image format jobs. They can also update their assignments and resubmit them before the deadline. After the teacher corrects the assignment, the student can select the desired assignment to view.
- Classroom Performance: It is mainly a record of answering questions in the classroom. After the teacher releases the answer, the students enter the classroom and click on the performance to answer. The operation interface is shown in Figure 6.
- Participate in the Test: After the student enters the class list on the mobile phone, select the class, click the test, enter the test interface, select the test to be tested, or check the score after the test.
- Classroom Members: After the students enter the class, they can click on the teacher or classmate to view the member information in the class, as shown in Figure 7.
- Data: After the student enters the classroom on the mobile phone, click on the data to view the information published by the teacher in the classroom, as shown in Figure 8.

3.4 Teacher Terminal

- Class Attendance: After entering the class list, select the class, click attendance, enter the attendance interface, enter the attendance name, select the attendance mode, and then the teacher can check if the student is present. After the attendance is completed, the teacher can modify the attendance status manually, as shown in Figure 9. The same as student terminal, the class attendance mode includes: (a) Traditional Attendance; (b) Digital Attendance; (c) GPS Attendance as shown in Figure 10; (d) QR Code Attendance.

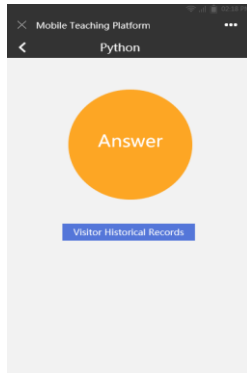


Figure 6. Classroom Performance

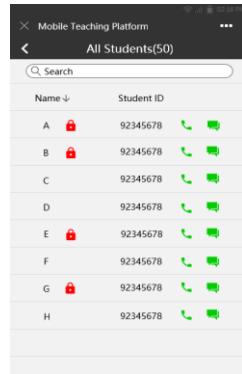


Figure 7. Classroom Members

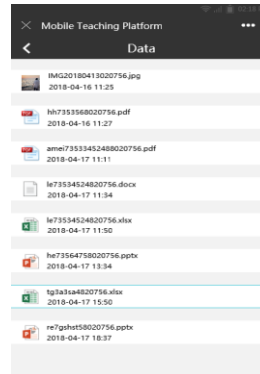


Figure 8. Data

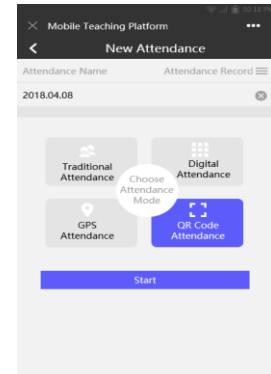


Figure 9. Class Attendance

- Classroom Work: the platform allows teachers to release tasks, which include: (a) Create A Job (b) Correcting Assignments (c) Job Settings: Select to hide or display grades for students; to remind students who have not submitted assignments, or to extend the deadline of assignments; teachers can click on the marker button to mark student assignments as needed; (d) Job Review: In the Job discussion interface, teachers and students can add comments to the assignment.
- Classroom Performance: After entering the class list, select the class, click on the performance to enter the performance interface, select the question mode to ask questions, and it divides into three questioning methods: random question, race to be the first to answer a question, and name-calling question, as shown in Figure 11. In the performance interface, the teacher can view previous questions and class summary. As shown in Figure 12, the performance interface also includes the interface of waiting for answer.
- Voting: At present, only the mobile phone supports the voting function. After the teacher enters the classroom, he/she chooses vote button. Click the plus sign on the upper right to add a vote, edit the voting content, and begin to vote after setting.

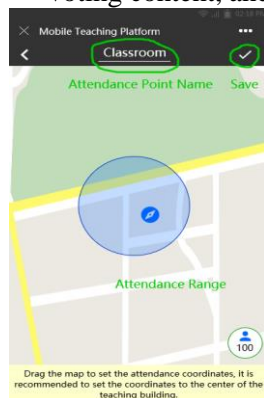


Figure 10. GPS Attendance

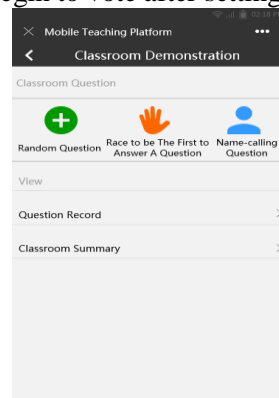


Figure 11. Three Methods

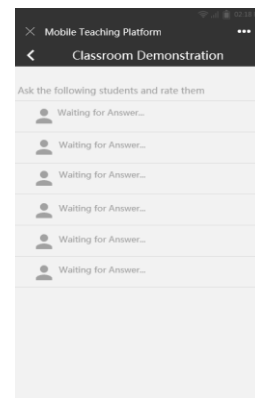


Figure 12. Answer

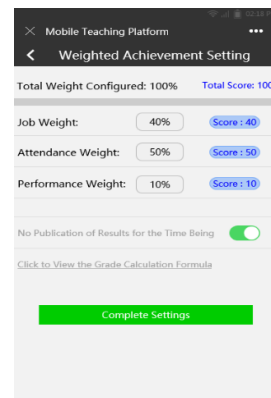


Figure 13. Grade Weighting

4. Implementation and Evaluation Results

We designed a mobile teaching platform software using the convenience of the WeChat public platform, which can collect data on students' daily grades. In this section, we show the relationship between the usual grades (daily performance) and the final exam grades, as well as the impact of the homework achievements, attendance results and classroom performances of the daily grades on the final exam grades. When calculating the usual grades, the teacher can click the score weighting setting on the total score interface to assign weights to each grade component, as shown in Figure 13. After the teacher performs the score weighting setting, click to get the latest data, and the system will calculate the usual score automatically.

In order to verify the positive impact of the usual grades on the final exam grades and the auxiliary role of the mobile teaching platform in student learning and teacher teaching, this paper uses

the mobile teaching platform to collect the students' usual learning data and final exam data. This data comes from 89 undergraduate students. We recorded a semester learning data for the PHP programming course through the mobile teaching platform, which made the learning evaluation method diversified, not only rely on the final exam scores. It can be seen from the change trend of the daily performance and the final exam grades, as shown in Figure 14. The daily grades have a certain influence on the final exam grades. Through analysis, 49 students in the final exam grades are above the median score. There are 54 students in the usual grades above the median score. It can be seen that the students with good daily grades have relatively good final exam grades. Through the analysis of Figure 15, it can be obtained that the homework grades are more correlated with the final exam scores. Among the homework results, 64 students are above the median scores. For the attendance, it is impossible to clearly see its impact on the final exam grades. This is mainly because most students have a higher attendance ratio. In addition, the classroom performances have not been analyzed because of the page limitation. In summary, paying attention to students' daily grades is very helpful for improving students' performance and teachers' guidance for students' learning, and the homework grades can better reflect students' learning.

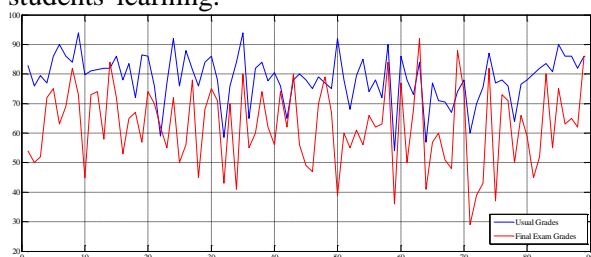


Figure 14. Daily Grades and Final Exam Grades

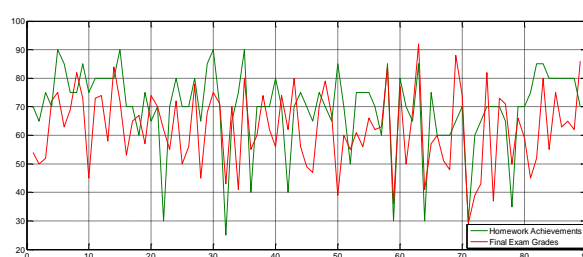


Figure 15. Homework Achievements and Final Exam Grades

5. The Conclusion

The mobile teaching system implemented in this paper is a third-party mobile learning platform based on the open interface function of Tencent WeChat public platform. The structure function is clear and the operation is simple. The system function includes various requirements of education and teaching. Teachers use this system for supplementary teaching, which is convenient and simple. Students only need to pay attention to the course WeChat public number loaded with this system, and they can use mobile intelligent terminal to study, discuss and evaluate.

The mobile teaching platform can monitor and record the student's learning progress and test situation, and provide a decision-making reference for the teacher when they monitor students' learning process. It is beneficial to evaluate students and teachers formatively. Due to the real-time interaction of the functions, it enhances students' ability to collaborate and explore when they discuss in a group and have a test in the class. And it improves students' initiative in learning while supervising students' classroom behavior. The model is not only low in development cost but also easy to implement, and it is ultra-lightweight and highly stable. And the mobile teaching platform has a good cross-platform nature. It can be used on both the WeChat and PC sides. Due to its technical simplicity and convenience, students are easy to use and it is conducive to mass promotion.

The mobile teaching model based on the WeChat public platform has practical application value. For related teachers, it is necessary to further develop the superiority of the WeChat public platform in the future work. We still have a long way to go especially in the use of mobile teaching platform to monitor student learning behavior. And we should find more new paths that will help to carry out mobile teaching. Finally, we can reach the goal of further improving the quality of teaching.

Acknowledgements

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