Teaching Practice of Data Structure Based On WeChat Platform

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Abstract. With the development of the mobile communication network, mobile learning is becoming a hot spot in the world. According to the idea of system engineering, this paper describes the teaching design process based on WeChat, which is divided into three parts, i.e. teaching preparation, teaching implementation and teaching evaluation. It also elaborates on the specific activities of each stage. The result shows that teaching activities based on the WeChat platform can promote students’ learning and have certain practical significance.

Keywords: Mobile Learning, WeChat, Teaching Activity, Data Structure

1. Introduction
Over the past decades, mobile learning has attracted the increasing attention of scholars at home and abroad, accompanied by a growth spurt in related theories, resources, teaching design, as well as research on software platform construction. Ma Yuhui, Zhao Le, et al. [1] sorted the development process of mobile learning resources, explained the development model of education apps in the dimensions of resource construction, promotion, supervision, application, and proposed feasible suggestions. Qiu Bingfa, Ma Yan et al. [2] explored the crucial issues during mobile learning resource construction and developed an interaction-based design model of mobile learning resources. Li Xiaoxia et al [3].analyzes the implementation of the teaching process on UMU. The authors believe that the application of the platform can simplify the production process of micro lessons and strengthen the dominant position of students.Except that the big data analysis function of the platform provides a strong support for teachers’ teaching and makes online and offline leaning more closely combined. Huang Boping et al [4]. analyze the specific problems in the process of designing mobile learning resources. And proposes a hybrid learning medel. Lin Shubing et al [5]. think that we should try our best to improve the media and information literacy of teachers and students, and establish the corresponding classroom teaching innovation culture. Jiang Zhihui et al [6]. constructed a Wechat-based learning model of multi-terminal interactive inquiry, and analyzed the feasibility of the model from the dimensions of pedagogy, social interaction and technological support. Liu Yaonan [7] analyzed the model of mobile learning and took “Computer Fundamentals” as an example to illustrate its specific process in the model. Wang Ping [8] illustrated the design framework of the WeChat mobile learning platform from the perspective of platform construction and application development and conducted teaching practice and analysis with “C Programming” as an example. Hu Xiaohui [9]
analyzes the design points of the content and interface of mobile learning strategies that teachers and learners should pay attention to in the development of mobile learning app.

Based on the above literature, the demand analysis of mobile learning and other mobile learning theories will provide guidance and support for mobile learning practice, whether it is the framework of mobile learning theory or the construction of teaching models. Nonetheless, the limitations are still noticeable. On the one hand, the existing theories are mostly descriptions for empirical reflection at the macro theoretical level, which are not strong enough to guide the applications of mobile learning to specific courses. On the other hand, limited practical studies have been focused on such applications [10], where the performance measurement indicators are vague. To make up the above gap, this paper takes “Data Structure” as an example to investigate the teaching mode based on the WeChat platform. It is expected to provide support and reference for practical research in this field.

2. Design of Teaching Activities Based on the Wechat Platform

In accordance with the thought of system engineering, teaching activities based on the WeChat platform are divided into three stages, which are preparation, implementation, and evaluation, as shown in Figure 1.

![Figure 1. Design of teaching activities based on the WeChat platform](image)

2.1 Preparation Stage

(1) Analysis of teaching objectives

The teaching mode takes teaching objectives as the core and serves them. The teaching objectives can be well achieved if the teaching mode fits students’ learning habits, captures their learning interest, and promote their learning enthusiasm.

The course “Data Structure” equally focuses on theory and practice. From the perspective of knowledge and skills, it requires students to understand the characteristics of various abstract data types, master the implementation process of related operations, and develop the abilities to analyze various data structure characteristics, choose the appropriate data structure (logical structure, storage structure) for the target and conduct the algorithm design for the corresponding operation; from the perspective of process and method, it requires students to improve the abilities to program and analyze or solve actual problems with engineering methods; from the perspective of emotion and values, it requires students to cultivate computational thinking in the imperceptible knowledge impartation, and apply it to practical cases. The teaching content should be designed based on these three levels of teaching objectives, which will ensure targeted teaching activities.
(2) Analysis of teaching objects

Teaching objects are learners, i.e., the main participants and subjects in teaching activities. The efficient conduct of teaching activities is premised on the analysis of the knowledge construction of teaching objects and understanding of their learning characteristics. The students from private third-tire colleges have a weak knowledge base, low initiative in learning, poor self-discipline, and low hard-working spirit, but possess active thinking, distinct personality, and a strong desire for self-expression. Therefore, during teaching activities, it is essential to classify learners into learning groups according to their characteristics and make ensure that each group member fully participates in the group learning activities.

(3) Analysis of teaching content and preparation of teaching resources

“Data Structure” is a core basic course for computer-related majors, mainly focusing on the characteristics of various classic data structures and the implementation algorithms of related operations. Due to the abstract content and high programming capabilities required in algorithm implementation, several steps are needed before the implementation of teaching activities on the WeChat platform, including reconstructing the teaching content, designing interesting teaching cases, developing knowledge lists, and creating micro-classes with a duration of no more than 15 minutes, designing online test questions targeting knowledge points to be memorized, collecting and providing teaching auxiliary resources (related micro-class videos by experts, programming software manuals, etc.) for knowledge expansion.

(4) Construction of the WeChat platform

The procedure of constructing a WeChat platform is detailed as: a) apply for a WeChat subscription account, b) upload teaching materials such as syllabus, teaching calendar, micro-classes, and teaching content, c) establish a learning community based on WeChat Moments. It will allow students to study the course content at any time and any place, and conduct discussion with teachers and peers.

2.2 Implementation Stage

The implementation stage of the course teaching activities can be divided into three phases: pre-class, in-class, and after-class.

(1) Pre-class

Students watch the tutorial cases on the WeChat platform and clarify the study goals of this chapter, watch micro-class videos to learn basic knowledge points, communicate with teachers and classmates in WeChat Moments on what they confuse or do not understand, and finally complete the test questions and ring in online, which will be incorporated in the formative evaluation. Then the teacher analyzes the test results and summarizes typical errors for later explanation in class.

(2) In-class

According to the progress of the course, the in-class phase is divided into two situations: large discussion and small discussion. The former refers to a discussion class after the learning of each chapter. In this class, the teacher summarizes the teaching content of this chapter, presents pre-designed cases that are closely related to real life, and asks students to discuss in groups and analyze data characteristics, select the appropriate storage structure, and design related calculation algorithms. The latter refers to the usual teaching class. In this class, the teacher first summarizes the knowledge points of the micro-video and corrects the typical mistakes based on the results of the pre-class test. Then, students perform computer practice on typical implementation algorithms of related operations in the video. In this process, the teacher gives personalized guidance to students with poor programming ability and encourages students with stronger programming ability to the poor ones. The last steps are group discussion and rewriting of the implemented algorithm.

(3) After-class

Due to large workload of calculation in the data structure, many algorithms need to be implemented by students after class. Therefore, in the after-class phase, students’ tasks are mainly realizing the results of the classroom discussion by programming, discussing and solving the problems in the
programming process in the learning community of WeChat Moments, and presenting the course learning results.

2.3 Evaluation Stage

In the teaching process, the author conducted teaching activities by strictly following the design. To understand students' views of course teaching supported by WeChat, a questionnaire survey was performed on the WeChat public platform at the end of the semester. All of the 48 questionnaires distributed were returned. Table 1 lists its core content. The questionnaire was analyzed by SPSS software, with the reliability coefficient $\alpha$ of 0.918$>$0.9, indicating high reliability of the questionnaire. The validity coefficient KMO of 0.825, greater than 0.8, indicates a higher correlation between the questions in the questionnaire. Hence, it is a suitable analysis factor.

**Table 1. Questionnaire for “Data Structure” teaching supported by WeChat**

| No. | Questions                                                                 | Choices            | Proportion |
|-----|---------------------------------------------------------------------------|--------------------|------------|
| 1   | Did WeChat benefit your learning of this course?                          | 1) A lot                                      | 95%        |
|     |                                                                           | 2) A little                                  | 5%         |
|     |                                                                           | 3) None                                      | 0%         |
| 2   | Did this approach improve your interest in the subject?                   | 1) A lot                                      | 83%        |
|     |                                                                           | 2) A little                                  | 17%        |
|     |                                                                           | 3) None                                      | 0%         |
| 3   | Did it help improve your ability to solve practical problems?             | 1) A lot                                      | 15%        |
|     |                                                                           | 2) A little                                  | 85%        |
|     |                                                                           | 3) None                                      | 0%         |
| 4   | Does it help you to improve your teamwork ability?                        | 1) A lot                                      | 85%        |
|     |                                                                           | 2) A little                                  | 15%        |
|     |                                                                           | 3) None                                      | 0%         |
| 5   | Do you like this teaching mode?                                           | 1) Yes                                       | 80%        |
|     |                                                                           | 2) Just so                                    | 17%        |
|     |                                                                           | 3) No                                        | 3%         |

According to the results of the questionnaire, 80% of students reported that they liked this learning mode. In the daily communication with the teaching team members, students expressed that the course learning through the WeChat platform realized their zero-distance communication with teachers, gave full play to the role of the group leader, mobilized their enthusiasm for learning courses, and enhanced their sense of achievement. Some also reported a positive attitude despite the heavier task of self-learning.

3. Conclusion

Despite some achievements in the teaching of “Data Structure” based on the WeChat platform, some problems were also exposed. First of all, students were susceptible to interference from incoming calls, text messages, WeChat chats and other external information in the learning process, which reduced the efficiency of learning for students with poor anti-interference ability. Second, while narrowing the distance between the teacher and students, WeChat also motivated students to ask help from teachers and classmates in the first place rather than solve the problem independently. Third, due to technical limitations, automatic tracking the learning process on the WeChat platform is not feasible. These issues will be explored in further research.

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