Introduction of Microlecture into Experimental Teaching against the Background of New Engineering

Wang Hui
School of Computer Science and Engineering
Xi'an Technological University
Xi'an, China
277019826@qq.com

Hong Bo
School of Continuing Education
Xi'an Technological University
Xi'an, China
1964383053@qq.com

Abstract—**In order to meet the requirement in the computer network course of the new engineering, this paper proposed to introduce a fresh teaching method, microlecture, to the experimental teaching. Combined with the implementation of microlecture, the adaptive educational assistance, and the knowledge mapping were designed. The method is free of the teachers from the laborious teaching for dedicating to resolve to study problems with students. Meanwhile, a feedback mechanism is adopted effectively to improve the study interesting and to extend the innovative contents of teaching theory. Compared to conventional experimental teaching methods, the passing rate of a training base significantly increased. The practical result demonstrates that the method of introducing the microlecture is preferably applied for the experimental teaching of computer network course.**

Keywords—new engineering; microlecture; experimental teaching; teaching reform

I. INTRODUCTION

At present, the connotation of the new engineering is led by the high moral values establishment and people cultivation. Its philosophy is to cultivate diverse and innovative application talents through inheritance and innovation, crossover and integration, coordination and sharing[1].The network engineer major of Xi'an Technology University is biased toward basic theory and basic knowledge teaching in the process of talent cultivation. However, against the background of the new engineering, it is necessary to realize that the role of cultivating students' innovative awareness and ability through practical teaching is irreplaceable. The combination of application oriented teaching mode and innovative practice requires complementary theory and experimental teaching to complement with each other, and the cultivation of innovative ability as the main goal of experimental teaching [2].The implementation of the national optical network strategy and the continuous upgrading of mobile Internet technology make it possible to apply teaching methods based on video technology to university curriculum teaching. Meanwhile the miniaturization of microlecture, the fragmentation of knowledge content, and the ease of mobility have made it be a new teaching method. Although microlecture has developed quickly, there are few cases that are applied in computer network experimental teaching.

The teaching reform of the introduction of microlecture into the computer network experimental course against the background of the new engineering is discussed in this paper. Moreover, the teaching reform takes microlecture as the foundation stone and builds curriculum knowledge maps as traction to develop supporting teaching materials. And the teaching reform establishes a problem feedback mechanism based on micro-tasks. In order to concentrate on solving difficult problems, a comprehensive assessment method is finally established. Then the problems existed in the experimental teaching of computer network courses will be solved in the end.

The reform of computer network experimental teaching introduced in this paper is carried out by using microlecture. Moreover, how to give full play to the advantages of microlecture is the focus of current research.

II. THE CHARACTERISTICS OF MICROLECTURE AND RELATED RESEARCH APPLICATIONS

A. The characteristics of microlecture

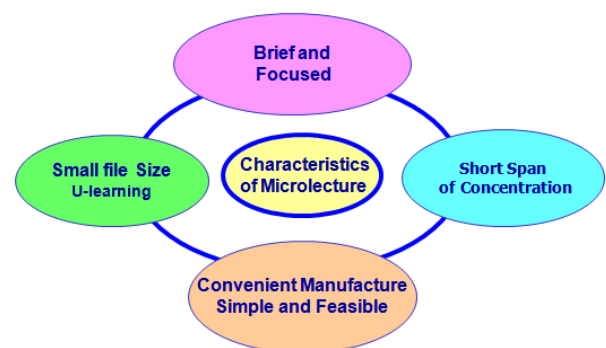The characteristics of microlecture are clear and mainly reflected in four aspects, which is shown in Fig. 1.

Fig. 1. The characteristics of microlecture.

1) The content is small, precise, and focused

One of the prominent features of microlecture is the fragmentation of the knowledge. It is different from traditional

teaching and it breaks down the content of curriculum knowledge. Combined with the micro-case, teachers can make a careful design of the fragmented knowledge points, which can be easily explained in the micro video. Combined with other micro-tasks and micro-tests, it is easier to achieve the learning goal of "learning one, understand one", and the traditional teaching content can be reconstructed.

2) Time of micro video is short, therefore, it is easy to grasp the learning attention.

Another outstanding feature of the microlecture is that it can be displayed with micro video in very short time . The length of video time can be determined by grasping the learner's attention and not fatigue. It is easier to achieve the learning goals of "learn one and understand one". It is equivalent to dividing the traditional teaching class into several microlectures, but the length of the microlecture is longer than the length of the traditional course.

3) The video file of microlecture is small and suitable for U-learning.

The files of microlecture include micro video and supporting micro-materials. The total size of the microlecture files is controlled within 50 MB. Micro video uses popular, compatible streaming media formats, and other files also use compatible formats. It is convenient for any learners to learn at any time, anywhere, and with any device, that is, U-learning.

4) The production of microlecture is convenient and simple.

Although there are many requirements mentioned above, the production of microlecture is simple and convenient. The production of microlecture can be done by using professional equipment or common equipment.

B. Research and Application of Microlecture

After years of development, microlecture has been applied to all aspects of education. Combined with the comparative analysis of micro-classes at home and abroad, Liang Le-Ming et al. give a teaching design pattern of micro-curricular in 2013[3]. In 2014, Yu Shengquan et al. proposed the idea of microlecture design based on learning elements, including microlecture design, teaching information description, microlecture aggregation and development model, etc[4]. Guo Shaoqing et al. analyzed the misunderstandings and problems in the design of microlecture in universities in 2014, and constructed a teaching model of microlecture[5]. Su Xiaobing et al.analyzed and studied the key elements of the microlecture and the teaching applications in 2014[6]. Wu Ping analyzed and summarized the application of microlecture in China in the context of "micro-era" in 2016[7]. Zhang Fangfang analyzed the impact of "micro-courses" on college teaching reform in 2016[8].

III. TEACHING STATUS AND PROBLEMS OF COMPUTER NETWORK EXPERIMENT

A. Teaching Status of Computer Network Experiment

With the promotion of "Internet +", computer network courses have undergone several teaching reforms. Now the curriculum and content have basically stabilized. Although the teaching content has changed along with the times, the teaching methods are still lagging behind. As experimental teaching is an important part of teaching, its methods and means are relatively outdated, and changes are needed urgently. These problems can be solved by introducing new teaching methods.

B. Existing Problems of Computer Network Experiment

At present, the problems in computer network experimental teaching mainly include the following points:

- The teaching model of large class teaching, and the experimental guidance is exhausting. At present, most professional basic courses in universities are taught in large classes, and students generally lack consciousness. Because of the large number of students and many experiments, many knowledge points need to be repeated several times in the experimental teaching process, and all these are the simplest and most basic knowledge points. In this way, teachers do not have time to instruct students in depth, and the effect of each experiment class is poor.

- Independent experimental content, lack of comprehensive experiments. The experimental content is independent, and there is no continuity, correlation, synthesis and innovation between each other. In particular, comprehensive experiments are particularly lacking. However, the knowledge points in computer network courses have the characteristics of progressive levels and mutual correlation. If a student does not understand a particular point in the course, it will be a direct result that He does not understand the deeper knowledge of the course.

- Passive learning, copying is serious. In the case of large number of experiments, independent experimental contents, lack of comprehensiveness, and less experimental hours, the students' motivation for learning has not been mobilized. They are all learning passively[9]. Without study enthusiasm will directly lead to that a lot of students copying the results of others' experiments during the experiment. Although the teacher sees the tricks, they cannot be eliminated.

- The way to obtain knowledge is simple, and students also lack the ability to study actively and the cooperative learning. The way to acquire knowledge is single, and it can only be acquired in classroom teaching and experimental teaching. Other times can only rely on the students themselves. Although there are teachers who give instructions during experimental teaching, they are all paid. Nowadays students are generally lacking in consciousness and cooperation. If they do not understand a certain point, the results will be difficult to achieve, or even completely abandoned.

IV. TEACHING REFORM BASED ON MICROLECTURE

A. Feasibility of Experimental Teaching Reform Based on Microlecture

Teaching of the computer network experiment has a very strong practical operation. As a new teaching method, microlecture can be combined very well and can achieve very good teaching effects.

1) Build a curriculum knowledge map and develop microlecture for fragmented knowledge

The knowledge points are layered and fragmented and decomposed according to the course content. And then independent and related knowledge points are formed, and the curriculum knowledge map is constructed finally. For each fragmented knowledge point, microlecture is developed. Complete microlecture development for each fragmented knowledge point.

2) One-to-one experiment instruction

With micro-video, micro-tasks, micro-tests and other supporting in microlecture, it is possible for teacher to instruct students experiment one-to-one in the case of large class teaching. Let students follow the map of knowledge map step by step, so that they will not give up if they don't understand anything. At the same time, teachers are also relieved from the exhausted experimental guidance. Thus, the teacher has the energy to guide the students to complete experimental teaching tasks and innovative experimental content, or to focus on assisting students with learning difficulties.

3) Intuitive steps, repeatable viewing content

The micro video in the microlecture can realize the intuitive operation steps for specific knowledge points. Combined with the matching micro-tasks, students can learn autonomously. And in the absence of a way to understand it all at once, students can repeatedly view and repeat the study on their computer or mobile phone.

4) Student team, cooperative learning

With the introduction of microlecture, students can study independently outside class, which creates the conditions for teamwork. Students can build their own student teams and promote learning through continuity, relevance, comprehensiveness, and innovative experimentation.

B. The Concrete Measures of Experimental Teaching Reform Based on Microlecture

The new engineering department advocates the need for traction disciplines, resources, mechanisms and systems for cross-convergence. Against the background of the new engineering, the microlecture will be introduced into the computer network experimental course to cultivate students' innovative ability in the practical teaching of network engineering[10]. The teaching reform takes microlecture as the foundation stone and builds curriculum knowledge maps as traction to develop supporting teaching materials. It is task-oriented and establishes a problem feedback mechanism, and concentrate on solving difficult problems. Finally, it establishes a comprehensive assessment method.

There are six concrete measures for the experimental teaching reform in the computer network. The relationship between them is not only progressive but also interrelated and mutually reinforcing, which is shown in Fig. 2. Through six specific measures, the reform of experimental teaching based on microlecture is constructed. The specific implementation can be abstracted as four key steps, and the relationship between them is a cycle, which is shown in Fig. 3.
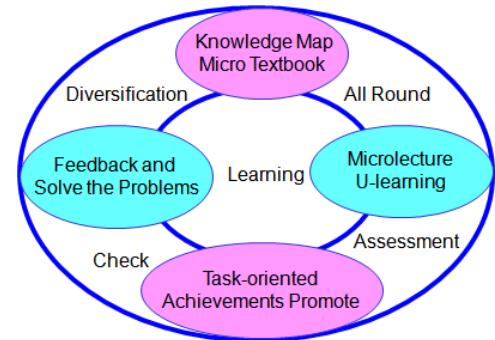

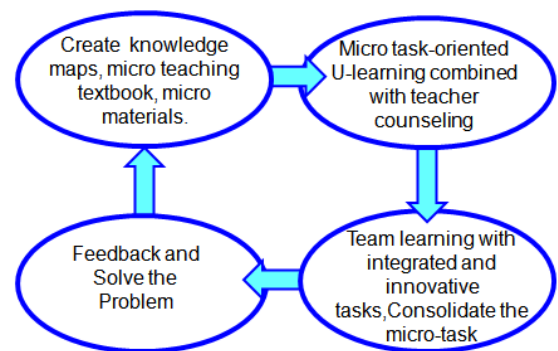Fig. 2. The relationship between the specific measures.

Fig. 3. The cycle between the key steps of experimental teaching.

1) Change the teaching mode and focus on learning

We must change the teaching-oriented model, require students to enter the learning state in advance, and implement generalized learning and team learning on the basis of microlecture. Freed from "score is the king" and play the emphasis on the practical operations. In order to achieve learning through the comprehensive innovation applications, and the combination of process and results of the multiple assessment methods.

2) Build curriculum knowledge maps and develop teaching aids for microlecture

The knowledge structure map is constructed according to the contents of the computer network curriculum. The fragmented knowledge points in the map are combined with the micro-cases and micro-tasks, which are used to develop the experimental guide of computer network based on the microlecture.

3) Create micro video and provide U-learning

According to the relationship between the knowledge maps, the fragmented knowledge points in the teaching materials are developed into micro-videos in which the contents are related

to each other. Finally, the micro video is uploaded to the school website server for students to learn and use. It is convenient for students to learn at any time, anywhere, and with any terminal, that is, U-learning.

4) Task-oriented,achievements are displayed as promotion

The student team is the implementation unit and the micro-task is the learning path to reinforce and consolidate the integrated tasks of micro-tasks. Think about how to use the micro-knowledge innovation task flexibly. Through the discussion and analysis of problems, solutions are obtained and results are implemented to train student teams in collaborative learning. Finally, the display of achievements will further strengthen the promotion of teaching reform.

5) Problem feedback mechanism is established to focus on guiding and solving puzzles

Through centralizing instruction, the teacher solves the most questions asked by the students frequently or the general problems feedback by micro-tasks, comprehensive tasks, innovation tasks and other channels in the experimental teaching.

6) Establish a comprehensive assessment model

The traditional homework assessment method must be changed, and a diversified and comprehensive assessment method would be established to meet the microlecture. The assessment methods include the experimental process, micro-tasks, comprehensive tasks, innovation tasks, results display, questions and answers, team and team member performance and other assessment content.

C. Figures and Tables

The computer network experimental teaching reform was implemented in the school of computer science from the 2014 level. The computer network is based on practical operations. The passing rate of practice exams in the training base can be used as the basis for verifying the effectiveness of the reform. The statistical results are shown in Fig. 4.
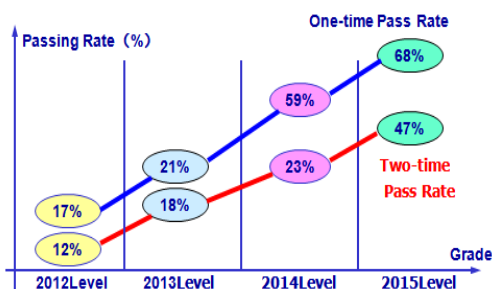

Fig. 4.   The Pass Rate of Computer Network Practice Test.

We can see from Fig. 4 that the passing rate of practical examinations for students of 2014 grades has changed significantly after the microlecture was introduced in the experimental teaching reforms. The one-time pass rate has risen by 38% directly, and many students have passed the second exam. It is proved that the reform of computer network experimental teaching based on micro-teaching is practical and effective.

V. Conclusion

The reform of experimental teaching was carried out by introducing microlecture into the computer network experimental course against the background of new engineering. The teaching reform changed the experimental teaching model effectively and improved students' interest in the independent learning, the independent innovation, and the practical ability. Although many deficiencies of traditional experimental teaching can be changed by using microlecture, it is necessary to pay attention to the special nature of the curriculum and build a microlecture experimental teaching model that varies from class to class. The content of microlecture should also be raised above the students' all-day learning or lifelong learning during school.

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