Design and Application of Micro-lecture in Personalized Teaching of Computer Network

Liu Tianjiao
The University of Manchester
tianjiao.liu@student.manchester.ac.uk

Abstract: With the continuous development of social economy, more and more people begin to pay attention to the teaching methods of micro-lecture. In recent years, micro-lecture has been widely used in education. The advantage of micro-lecture is that it breaks through the limitations of traditional teaching mode in time and space. As a currently efficient teaching method, micro-lecture can make abstract knowledge straightforward and concrete, and it give students' initiative a full play to improve students' ability of learning on their own. Therefore, it better realizes the cultivation of students' core literacy. Therefore, the personalized classroom in the age of computer network needs to design micro-lecture reasonably to play the role of micro-lecture and improve the effectiveness of teaching. Nowadays, many school leaders and teachers have begun to adopt teaching methods of micro-lecture. Apart from the high teaching efficiency of micro-lecture, the teaching mode of micro-lecture also meets the requirements of the new curriculum reform to improve teachers' professional quality. This paper mainly studies the design of micro-lecture and its application in personalized teaching of computer networks.

1. Introduction
At present, due to the rapid development of computer networks, the traditional computer education model can no longer adapt to the development of the times and can’t meet the learning needs of students.

Therefore, it is necessary to find new teaching methods to adapt to the development of the times. As a new form of computer teaching, micro-lecture teaching has unique advantages which are advanced and have convenient characteristics. It is very suitable for the needs of current computer education. In recent years, the new educational model of micro-lecture has been very popular all over the world, and it has been continuously developed and promoted.

2. Overview of micro-lecture
Micro-lecture is a new name that has become popular in recent years. It mainly refers to a structured digital resource that uses information technology to present fragmented learning content, process and expanded materials in accordance with cognitive rules. It can focus on important knowledge points in a short time. Micro-lecture mainly uses the currently advanced computer and network technology, as well as mobile terminals (such as mobile phones) so that students can easily download, watch and learn at anytime, anywhere [1]. Micro-lectures not only include simple and convenient multimedia courseware, which can assistant teaching activities, but also include video slices, which can record of classroom teaching live. Public courses in the video are also included in the above range. It is the goal and essence of micro-lecture to carry out refined design around a certain teaching knowledge and skill points. Through the organic combination of teaching tasks, it can truly support students' personalized
learning. At the same time it has the advantages and characteristics of digitalization. Meanwhile, micro-lecture is also a kind of teaching scene, which can realize one-to-one personalized teaching to a certain extent. This teaching method is essentially different from one-to-many classroom teaching. Micro-lectures can realize one-to-one tutorial to students and realize a reasonable narration of a knowledge point in a short time. It is especially suitable for the use of micro-lecture in students' autonomous learning.

3. Features of micro-lecture

3.1. Short teaching time
Teaching video is a core part of the micro classroom. According to the cognitive characteristics and learning rules of primary and middle school students, the duration of "micro-lecture" is generally about 5-8 minutes, and the longest is no more than 10 minutes. Therefore, compared with the traditional teaching examples of 40-minute or 45-minute course, "micro-lectures" can be called "fragments of classroom." However, the fragmentation of micro-lecture learning time does not mean the fragmentation of curriculum design. It is the concentration of curriculum content and has a complete structure, including teaching design, media strategy, and list of learning tasks.

3.2. Less content in classroom teaching
Compared with traditional teaching methods, micro-lectures have the characteristics that it has concentrated questions and clear subjects. These characteristics are more suitable for teaching. However, teaching objectives, teaching content, and teaching resources are still important components of the micro-lecture. At the same time, it should be noted that the teaching activities and teaching evaluation are all covered by the above-mentioned scope, and the micro-lecture can realize the complete inclusion of teaching design. Micro-lecture teaching presents the knowledge points (including basic, difficult and key knowledge) of different subjects and different courses in classroom teaching in the form of multimedia education. Unlike traditional teaching, which teaches a lot of knowledge in each lesson, the content of micro-lecture teaching is the essence, so micro-lecture is also called "micro-lecture".

3.3. Small resource capacity
Small capacity and short time are the distinguishing characteristics of micro courses. One course can only achieve one specific knowledge or skill point. However, the micro-lecture can include necessary information such as teaching goals and teaching activities, and maximize the manifestation of its own value and meaning, in which no other technical support is needed. In addition, it can be flexibly and conveniently downloaded and saved in the terminal (laptop, mobile phone, etc.) to learn at anytime, anywhere.

3.4. Clear themes and specific content
Video is the main content of the micro-lecture, and the quality of the video directly affects the teaching effect. In this regard, when teachers are designing micro-lecture videos, they need to conduct in-depth research on teaching content, and design in combination with students' hobbies, so as to ensure that videos meet the needs of students and better assist teaching. The content of course is a topic or a problem. The research questions come from specific problems in the teaching process: including reflection of teaching, key points of teaching or learning strategies, teaching methods, teaching perspectives and other problems that need to be resolved.

3.5. Grassroots research and interesting creation
Anyone can become a course developer because the content of the course is small. Since the main body of the curriculum is teachers and students, the purpose of curriculum research and development is to closely link the teaching content, teaching objectives and teaching methods, rather than verifying
and reasoning about the theory. The content of research and development should be familiar and interesting to teachers and they are able to solve the problem. Therefore, teachers should be able to highlight the important and difficult points of teaching when designing micro-lectures, and design clear teaching goals to guide students correctly and facilitate students' understanding and mastery of mathematical knowledge. At the same time, micro-lectures also need to have a certain amount of questions for students to think and create, so as to improve students' independent learning ability.

3.6 Simplified results and diversified dissemination
Because the content is specific and the theme is prominent, the research content is easy to express and the research results are easy to change. This is a kind of convenient dissemination and mobile learning, and the scientific use of micro-lectures can also be realized in the actual fragmented learning. In addition, in the evaluation of micro-lecture teaching, teachers continue to enrich the communication channels by the use of the information platform to connect with teachers, students and parents, forming a good interactive relationship. And teacher-student mutual evaluation and student-student mutual evaluation are actively carried out to help students solve the problems they encounter in time, and better realize teaching in accordance with their ability and personality.

3.7. Timely and targeted feedback
In a relatively short period of time, the "lifeless classroom" activities are vigorously carried out so that participants can listen to other people's evaluation of their educational behavior and obtain feedback. Compared with regular classroom listening and commenting activities, micro-lecture is more immediate. As a pre-class "rehearsal" of group, everyone participates in the group, learns and helps each other, and develops together. To a certain extent, it reduces the pressure of teachers without worrying about "failure" or evaluation of "education", which is more objective than regular classroom evaluation.

4. Application of micro-lecture in personalized teaching
In the micro-lecture system of computer network course, the knowledge points in the micro-lecture show the characteristics of hierarchical structure. Modern society is in the micro era of Weibo, WeChat, and micro movies. Under this social background, learning is gradually realizing the development of micro-comparison, fragmentation and socialization. At the same time, popularization and grassroots are also the trends of future development. And the information teaching environment and the teaching mode all need to be reformed. Micro-lecture is a new type of teaching model, which needs to continuously adapt to the development of the times, and it can achieve effective satisfaction of mobile learning, ubiquitous learning and fragmented learning to a certain extent. Therefore, more people must pay more attention to it and realize the scientific use of micro-lectures in combination with the actual situation of personalized teaching. Table 1 shows the knowledge points of the computer network micro-lecture selected by using the principle of micro-lecture selection. In addition to designing basic knowledge points, micro-lectures should be designed for more difficult knowledge points and supplementary content to meet the needs of students with better learning ability. First of all, in addition to the narrative content in the first six chapters of the textbook, we will also conduct curriculum design for the next chapter on network security, audio and video on the Internet, wireless networks and mobile networks to promote learning. For students interested in the Internet, the main function of this part of the micro-lecture is to introduce and tutor related knowledge. Secondly, the teaching design is based on the difficult knowledge and difficulties in Chapter 6, and the important and difficult points are explained. The hierarchical design of knowledge points can meet the needs of students at different levels. In the course, students are asked to learn the basic knowledge points first, and then learn the knowledge with slightly increased difficulty. The basic knowledge points are required to be learned, and the more difficult knowledge points depend on the students' personal abilities.
Table 1 The division of knowledge points of computer network course micro-course design

| Chapters of course | Basic knowledge points | More difficult knowledge points |
|--------------------|------------------------|-------------------------------|
| Overview           | Overview of the Internet, the core part of the Internet, computer network performance indicators, entities, protocols, services and service access points, TCP/IP architecture | Packet switching, store and forward |
| Physics level      | Data communication system model, channel multiplexing technology, guided transmission media, broadband access technology | Code division and multiple access |
| Data link level    | Error control, CSMA/CD protocol, physical layer extended Ethernet, self-learning of Ethernet switch, virtual local area network | Calculation of CSMA/CD Agreement |
| Network level      | IP address, address resolution protocol, packet forwarding process, RIP protocol, router composition, IPv6, network address translation | Virtual network interconnection, routing protocol calculation |
| Transmission level | The difference between TCP and UDP, the working principle of reliable transmission, TCP flow control, active queue management, TCP connection management | The working principle of reliable transmission, the calculation of TCP flow control |
| Application level  | FTP protocol, TELNET protocol, World Wide Web Information Retrieval System, Simple Mail Transfer Protocol, P2P file distribution | Use of email client, simple network management protocol |
| Network safety     | Security threats facing computer networks | Symmetric key cryptosystem and public key cryptosystem, digital signature |

In the process of creating micro-lectures, the appropriately added scene graphs are presented by PowerPoint presentation, setting questions in appropriate places to help students understand to increase learning interest and improve students' thinking and problem-solving abilities. When designing micro-lectures, teachers should run it through the entire teaching process, and design videos that focus students' attention and stimulate students' interest in learning during the introduction, and enhance students' participation in the classroom. Micro-lecturees effectively enhance students' autonomy, activate students' thinking ability, make classroom teaching form a good teaching atmosphere, and effectively realize the interaction between teachers and students, and improve students' learning efficiency. The good teaching scene in the learning process of micro-lecture helps students maintain their interest in learning, guides students to conduct independent exploration, and develops students' thinking ability. In addition, a small test is designed for each key knowledge point, usually in the form of multiple-choice questions. Students can spend very little time to complete it. The micro-lecture system will automatically track and record the time taken by students to complete the exam and the accuracy of the answers. Teachers pay attention to knowledge points that most students didn’t master in teaching, and focus on students who perform poorly in the learning process of micro-lecture. Through the hierarchical design of knowledge points and the insertion of tests in the micro-lecture, teachers can easily understand the students' learning status and mastery of new
knowledge, so as to achieve more goals in the classroom description. In the actual teaching process, students watch videos and discuss, and then the teacher will explain more problematic knowledge points based on the students' learning results and discussions in micro-lecture.

5. Problems and solutions in personalized teaching under computer network environment

The personalized teaching mode of the computer network environment has a very high learning efficiency, but we must know that the negativity of the network can not be ignored.

5.1. Ignorance of specificity

In the computer network environment, there is no time and place restrictions. Each learner can choose a different time for personal study, but the theoretical knowledge and required learning resources are the same. That is to say, the teaching method that are applied to other students are at the same level, and it only pays attention to the general conditions of the students, rather than the specific situation of the individual [2]. This requires teachers to pay attention to teach at different levels when designing micro-lectures, such as dividing theoretical knowledge into basic, intermediate, and advanced so that students choose the teaching level based on their own ability and learning level.

5.2. Lack of communication between teachers and students

In the current education reform, emotional communication and education play an important role in modern education. Sometimes, the teacher's encouraging expressions and happy smiling faces can greatly promote students' learning, but it is difficult to achieve this kind of emotional communication in micro-lecture teaching. Although a certain degree of rewards can be obtained through other means, these rewards are limited in terms of educational effects and emotional communication. Therefore, teachers can design some programs in the teaching process so that the education system automatically displays text, images or some small animations. The purpose of these programs is to encourage students to learn, and at the same time increase the joy of learning and make students spiritually satisfied.

5.3. Easy to get lost in network knowledge

With the aid of the computer network environment, the network provides students with a lot of learning materials, including very rich knowledge and complex information. Students who lack self-learning ability and enthusiasm often feel overwhelmed [3]. There is a very close connection between knowledge and knowledge, and the order of learning between knowledge and knowledge is also particularly important. For some students, it is easy to get lost in these knowledge links if lack of necessary guidance. Over time, students will feel a lack of self-confidence and become bored with learning, which is not conducive to the healthy development of students.

5.4. Lack of real-time monitoring

Learners learning through the Internet is a kind of personalized learning. It is difficult for learners to control their own learning process, and it is difficult for teachers to control every student's learning process. Learners with strong self-awareness will constantly adjust in the learning process to achieve better results, but learners with poor self-awareness can hardly guarantee the learning effect [4]. Therefore, this type of online education system should continue to expand its functions and strengthen the monitoring of learners' learning. This is not limited to checking learners' online learning time, but should also be based on other tasks, such as submitting homework within a limited time and real-time feedback, etc. It will eventually improve the teaching supervision system.

6. Conclusion

Due to the continuous development of computer technology and the widespread application of computers, the increasing importance of basic computer education and the nature of computer majors, the traditional learning model that combines basic knowledge learning with computer practical
operations is no longer suitable. Through the introduction of micro-course teaching, the practicability and interaction of the teaching process can be enhanced, so that students can not only obtain basic knowledge, but also effectively strengthen the training of professional skills. Micro-lecture learning can help students review their knowledge points after class, increase students’ understanding of knowledge and improve their learning effects so that they can fully mobilize students’ enthusiasm for learning, improve their independent learning ability. Students can better understand and master the professional knowledge. And hopefully it can greatly improve the quality of teaching and even the overall education level.

References
[1] Xie Qing, He Jianghong. The exploration of teaching mode under the network environment [J]. Computer Age, 2009 (5).
[2] Zhang Zhihong. Micro-course: a new type of learning resource[J]. China Educational Technology and Equipment, 2013 (20).
[3] Zhu Weili. Teaching design of document retrieval course based on flipped classroom[J]. Professional Education, 2013, 2(4): 87-91.
[4] Pan Nengwen. Computer network micro-course teaching design focusing on improving practical ability [J]. Electronic World, 2017 (12): 73.