The Application of Micro–learning in Integrated Teaching of Single Chip Microcomputer

Xinyue Liu\textsuperscript{1,a} and Liying Feng\textsuperscript{1,b}

\textsuperscript{1}Tianjin University of Technology and Education, Tianjin 300222, China

\textsuperscript{a}liuxinyue810401@163.com, \textsuperscript{b}40144188@qq.com

Keywords: Micro-learning; integration; SCM; mobilize; improve.

Abstract. Micro-learning is a new type of information-based teaching methods, which has a prominent theme, short and pithy, interactive, and application of a wide range of features. In this paper, with the characteristics of micro-learning itself, micro-learning is introduced into the integration of single-chip microcomputer (SCM) teaching to solve the practical problems of SCM teaching in colleges and universities. Contextualized micro-courses are designed and developed aiming at the teaching link of the projects in integrated teaching of SCM. In the course of teaching, micro-courses are applied to the teaching process, such as before class, during class and after class. Then learning, feedback and summarizing can make good links. The development and extensive use of micro-courses not only meet the needs of students at any time and place, but also mobilize the positive initiative of students to improve the quality and effectiveness of teaching.

1. Introduction

With the development of wireless networks, mobile communication networks and mobile terminal equipment, a variety of micro-channel platform is also developing rapidly. Micro-letter, micro-blogging, video and other interpersonal communications become the main form of information sharing. In addition to the great influence of the information age in daily life, it has also brought about many changes in the field of teaching. Micro-learning\textsuperscript{[1]}, flipped classroom\textsuperscript{[2]}, mobile learning\textsuperscript{[3]} and other new learning methods have become a new concept in the development of information technology education. Micro-learning is a new type of information-based teaching methods, which has a prominent theme, short and pithy, interactive, and application of a wide range of features. In the role of the competition micro-courses of the national university, these novel micro-courses teaching methods are widely deployed in major colleges and universities. The micro-learning is mainly based on the video as the main carrier. The online video course is designed for situational learning and supporting multiple learning styles.

2. The present situation of curriculum theory teaching of SCM principle and application

2.1 The characteristics of traditional teaching of SCM.

The principle and application course of SCM is a course with relatively strong application. It integrates the knowledge of analog electronics, digital electronics, electronic welding, PCB production, circuit design and so on. It is a professional basic course of electronics, electrical, automation, computer, electromechanical integration and so on. Traditional teaching\textsuperscript{[4]} usually involves two stages which are the imparting knowledge and knowledge absorption. Imparting knowledge is taught by teachers in the class. Knowledge absorption is completed by the homework after class. In the process of imparting knowledge, it is generally combined with the corresponding picture and other information in the traditional class. The internal structure of the microcontroller, programming language, programming ideas is mainly explained. In this process, on the one hand students have access to some new terms and concepts. On the other hand, we should master the principles or programming of the corresponding concepts of nouns. So the teaching effect is not very good. Even though there are some multimedia materials that can be shown to students, there is still a great sense of distance for students to produce practical experience. From the teaching situation for
many years, students generally reflect more knowledge of single-chip, obscure content, especially the practical skills difficult to grasp.

2.2 The Implementation of Integrated Teaching Reform in SCM Teaching.

The teaching purpose of SCM course not only requires students to master the basic theory of SCM, but also trains students to have better practical ability and innovative ability in the development of SCM. The ability of students training and job training should correspond to the real seamless integration with the social needs of the industry. According to the above requirements, our school has applied the teaching model of "integration of teaching and learning"\(^5\) into the teaching of SCM, and has achieved certain teaching results. The essence of the integration of teaching is to combine teaching with practice. The teaching is carried out in the training ground\(^6\). In the form of project driven, students can learn skills and acquire abilities, so that the professional theoretical knowledge and practical skills are effectively integrated into one another.\(^7\) According to the teaching objective, the teaching content is modularized. Each module undertakes different teaching tasks which are from simple to complex. Optimize and combine the knowledge which is repeated and crossed between each teaching module. Gradually, students gradually master the methods and steps of SCM product development, so as to achieve the purpose of repeated training and strengthening skills. The teaching content is divided into five modules. Each module is implemented with a specific project. In the process of completing the project task, the students can understand the internal structure of the SCM and master the programming skills more deeply. The distribution table for "integration of teaching and learning" SCM course content is shown in table 1.

<table>
<thead>
<tr>
<th>Module 1</th>
<th>Module 2</th>
<th>Module 3</th>
<th>Module 4</th>
<th>Module 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theoretical study</td>
<td>Application of SCM Output Circuit</td>
<td>Application of SCM input circuit</td>
<td>Application of single chip microcomputer internal resources</td>
<td>The integrated application of SCM</td>
</tr>
<tr>
<td>Principle of SCM</td>
<td>Item 1 Design of water lamp</td>
<td>Item 4 Keyboard scanning and Application</td>
<td>Item 5 Timer / counter programming and Application</td>
<td>Item 8 Programming and Application of D/A and A/D</td>
</tr>
<tr>
<td>C51 programming language</td>
<td>Item 2 Static and dynamic display of LED</td>
<td>Item 6 Programming and application of external interrupt system</td>
<td>Item 9 Programming and application of digital temperature sensor</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Item 3 Application of LCD</td>
<td>Item 7 Programming and application of serial communication</td>
<td>Item 10 Programming and application of pressure sensor</td>
<td></td>
</tr>
</tbody>
</table>

However, in the process of teaching integration, students are generally reflected in the actual programming process. The theoretical knowledge can’t be understood and absorbed in real time. Micro-learning can better solve these problems in the process of teaching reform. Micro-learning development and extensive use, on the one hand, the difficult knowledge, concepts and principles can be shown in front of the students by means of video. On the other hand, it meets the needs of students to study at any time and place. The application of micro-learning in the course of "principle and application of SCM" can greatly improve the teaching effect and the initiative of students.

3. Application of micro-learning in integrated teaching of SCM

Micro-learning mainly meets the fragmentation teaching of students. Students can choose the content, time, place and method in a relaxed state of mind to get a brisk according to their own wishes. Therefore, it must be integrated with a variety of media\(^8\). Multimedia technology can fully demonstrate the connotation and charm of knowledge and change knowledge into artwork. The micro-courses are mainly presented to students in the form of flash. In the process of making, we
should highlight the interesting of knowledge, and also embody the design elements such as the collocation of colors and the composition of the screen. Students become a kind of spiritual enjoyment in the micro-learning learning.

Micro-courses are mainly used in the course of integrated teaching of SCM in three links: before class, in class and after class. Before class, the main process is to learn new knowledge. In class, the students are divided into groups to discuss the process of exchanging and promoting the internalization of new knowledge. After class, the main link is to summarize, and further consolidate the students' knowledge of the situation. The basic framework of the micro video course is shown in Fig.1.

Micro-courses can be studied through WeChat, micro-blog and other platforms. Real time learning can be achieved by mobile terminals. Make full use of fragmented learning time to improve the efficiency of students' learning, and virtually extend the time of students' study.

![Figure 1. The basic framework of the micro video course.](image)

### 3.1 Implementation link before class.

Before the theory teaching, let the students watch the corresponding micro class video first. Thus, when it comes to the specific program design, students have already had a preliminary impression on the microcontroller interface circuit and programming ideas. When the teacher mentions the corresponding noun concept in class, the student can have a clear idea, not to accept the "cramming" teaching in the ignorant state. Different from the general teaching video, in the process of micro-learning production, it also refers to a large number of information technologies. Moreover, the essence of micro class is still in its miniaturization. In ten minutes or so of the video, the key points of the relevant theories, programming ideas and methods are vividly demonstrated. Students do not take too long to watch, and they do not easily distract attention. The application of micro-learning is based on the external interrupt programming and application project of single chip internal resource module. First, we introduce the real life example through flash to explain the concept of interruption. Such as the CPU is acted by a small friend called Xiao Liang. When Xiao Liang was cleaning up, he suddenly received the interruption signal of the kettle whistle. Xiao Liang interrupted cleaning work, transferred to perform irrigation work. Cleaning is the main function program part and irrigation is the interrupt program part. In the animation prominent eye-catching subtitles are added to attract students' attention. The task of the project is demonstrated through an example, and the interface and the circuit of the external circuit of the SCM corresponding to the external interrupt are introduced. Then flash is used to explain the method how to set the IE control registers, the priority control register IP, timer control register TCON and serial port control register SCON register, etc. According to the task of the project, the teacher can explain the design idea of the program, and demonstrate the debugging process through actual operation. Students can’t take up too much time during the break, after class and school break, and watch the micro video repeatedly and get enough knowledge.

### 3.2 Implementing link in class.

In class, teachers can decide the key points and difficulties of teaching according to the questions that student’s feedback. The teacher makes more reasonable teaching content, methods and progress.
Micro videos are appropriately interspersed into the teaching. The sound of micro video is eliminated. The teacher explained the micro-video problems on the scene. The teacher repeatedly asks questions and the students repeatedly study, so that students master the specific programming ideas and methods. In class, real-time tests can be conducted, and students are discussed in groups. The results of the test are presented to students in a statistical form through the feedback system of the micro-learning. In this way, students can improve their initiative and enthusiasm in thinking and discussing problems. The participation rate of class activities in class can be improved. Interactive classroom teaching model can be formed

3.3 Implementing link after class.
At present, the contradiction between the knowledge taught in class and the limited time in class has become increasingly apparent. The content of the class is too large and difficult for many students to reflect. It often appears that the content of this chapter has been forgotten. Therefore, the micro-learning is particularly important. After class micro-courses is mainly summarized and inquired problem, to further consolidate the students' knowledge of the situation. In the process of summarizing, we mainly review what we have learned before class and in class. In the process of inquiry, teachers hope that students will make a more in-depth inquiry into a problem, and expand the depth and breadth of students' learning. Micro-courses inquiry is mainly carried out in two ways. First, to connect the relevant learning materials, so that students can further study. The second is to propose different project tasks, so that students can use what they have learned to further consolidate their knowledge.

4. Conclusion
The application of micro-learning in the integrated course of SCM teaching makes the SCM course more intuitive, vivid and interesting. As a new way of teaching, micro-learning makes up for the shortcomings of the traditional teaching courses in class, before class and after class. Its popularity is "micro", which provides students with learning resources that are easy to use, easy to access, practical and practical. Micro-learning provides high-quality teaching aids and reference resources for learners, and also provides strong support for the innovative use of learning patterns.

5. References