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The Network Course Construction of Microcomputer Principles and Applications

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Abstract

Microcomputer Principles and Applications is an important professional basic course for a series of electronic information specialty, involving hardware and software technology. From the perspective of the curriculum reforms, this paper has made detail measures of the reforms. We develop principles which should be grasped in the construction of network teaching resources, then give a reform idea that traditional teaching should be combined with modern multimedia teaching and network teaching, also some suggestions on teaching management process and cultivating comprehensive ability of the students.

Index Terms: Curriculum Reform; Resources Construction; Teaching Methods

1. Introduction

Microcomputer Principles and Applications are not only an important specialized basic course for electronic information specialty but also a technical basic course for Machinery Manufacturing and Automatization, Electronics Materials, Safety Engineering and Equipments of Process Control. It is a comprehensive course involving hardware and software. The objective is making students to understand the basic structure of microcomputer, to master the assembly language programming and microcomputer interface technology, etc. The course is vital to cultivate students' ability of analyzing and solving practical problems by the knowledge they had learnt synthetically, and it is also an important course for culturing the innovative thinking and design ability. The teaching reform of Microcomputer Principles and Applications has received widely attention by higher education workers[1][2][3].

The reform ideas of curriculum are taking the students as the center, the curriculum reform as the foundation, the overall improvement of the teaching quality as the purpose. Through the reform, we can build the Microcomputer Principle and Application as a higher quality course inside the province. We can also make students have much stronger ability in design and application of the microcomputer and the theory related. The main thought includes four steps: firstly, establish the teaching system and formulate the multi-level syllabus accords with each specialty. Then integrate the teaching system and contents so as to realize the crossing

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cohesion of the course and specialty. The main task is to understand the relation between the programming and interface of the course, to grasp the connection of each chapter, and to determine the teaching contents of every chapter. Secondly, improve and perfect network courses furthermore. Thirdly, take the selection of textbook as the main, combine with references, syllabuses, teaching plans and experiences, and then make the multi-media courseware which fits for teaching face to face and network courseware. This courseware is suitable for self-study, and we can also make it to CD (digital lecture). Finally, take the adjustment of course teaching as basis, improve the basic knowledge and engineering ability of students, and cultivate the comprehensive quality of them.

2. The measures of curriculum reform

Design the syllabus accords to specialty and level to satisfy different specialty. The syllabus is the baton and starting point of the course, regulates the basic requirements of every links of the whole course teaching. It includes theory teaching, course experiment, course design, and expansive teaching. The whole university opens Microcomputer Principles and Applications for 10 specialties, and the requirement of them is different, so the standard syllabus is needed. In order to satisfy the requirement of each specialty, we made the syllabus of Microcomputer Principles and Applications in accordance with different specialties and levels. The syllabus includes the property, purpose, task, class hour and credit of the course. The syllabus of theory teaching is divided into 5 levels including 40 class hours, 48 class hours, 56 class hours, 64 class hours and 72 class hours. Experiment of Microcomputer Principles and Applications includes 2 levels as 8 class hours and 16 class hours. Design of the Microcomputer Principles and Applications is classified to 2 levels as 1 week and 2 weeks. Design the syllabus accords with specialties and levels could satisfy the requirement of different specialties, also could have the characteristics of system, of comprehensiveness, of levels, of standardization.

Construct a platform of computer hardware courses covers the whole non-computer specialties of the university to realize the sharing of resources; a network educational platform of Microcomputer Principles and Applications to realize the sharing of network resources and courseware. The Construction of network educational resources should take the students as the center, the assist learning as the main. It includes syllabus, learning guideline, network classroom, teaching video recording, experiment instruction, exercises and solution, course design, discussion, on-line test and other plenty of resources. These resources not only assist the students, but also the teachers especially the new teachers to grasp the key points and grow fast as possible. The construction of resources is squandering time and vigor, but the sharing of resources could decrease the repetitive work and save money.

Practice curriculum is opened separately and the reform of experiment teaching has taken great effects. Microcomputer Principles and Applications is a course whose theory and practice is combined, so it is vital to train the practical ability, and the reasonable design of teaching practice is the key to solve the problem that teacher is difficult to teach and student is hard to learn. Practice curriculum is divided into 2 parts, one is course experiment, and the other is course design. The course experiment assists to understand the teaching contents and grasp the basic methods; the course design really opens the thinking of students, so they can experience the happiness of making study serve the practical. There are more chances of practice for students which could promote the autonomous learning ability of them, so the teaching quality and effect has improved greatly.

We have built an advanced laboratory of microcomputer interface technology, and complied matching experimental teaching materials and guide books which are full of characteristics. Configure and integrate microcomputer technology experimental equipment, single chip experimental equipment, and control technology experimental equipment, all of them are serving for the course design. Because of the microcomputers application course design carried out at the end of every year, the number of students using the equipments will reach the peak in short time. Taking the course design in 2007 as an example, the number of 2004 grade students is about 500, but the interface experimental devices are 50 sets. There experimental devices were full load used in the course of   Microcomputer Principles and Applications Experiments, which is opened at peacetime to satisfy the needs of the teaching. But it is also very difficult to solve the shortage of experimental device even take the method of the dispersion when use in course design. Meanwhile, single chip experimental devices are

just in idle at the end of year (about 50 sets), and we can use them for the course design of microcomputer application system. In addition, students of Electron and Automation can combine the title design with professional learning. Some design subject can use computer interface resource of itself, vacating part of experimental devices to improve the utilization of the experiment resource. In a word, through the resource integration, the course design of microcomputer application can be performed and finally in a normal order. Meanwhile, in the content of course design, designing creative title should be combined with major training. It demand title itself has knowledge abilities, interests and challenges. The interests of design title are beneficial to stimulate students' thirst for knowledge, to play the creative talent, to enlighten students to master microcomputer interface knowledge synthetically in different angle.

We develop theory and experimental teaching of 32 bits microcomputer in consideration to basis, advancement and pioneering gradually, and then propose a new reform thinking of the contents of course and system reconstruction. Microcomputer principles have especial outstanding contradiction with the application teaching for its basis, advancement and pioneering. 16 bits microcomputer is the foundation should be strengthen, 32 bits microcomputer is the mainstream, also should be got breakthrough. Therefore, at the foundation of referring and absorbing the advantage of similar course both abroad and domestic, we present a teaching system which takes the 16 bits microcomputer as the main and gradually introduce the 32 bits microcomputer subsidiary. This way has much preferable consideration to basis, advancement and pioneering of this subject. Recent two years, we are developing course system reform. The concrete measures are as following: start from external characteristic of the chips, take the CPU system structure as the main line, and then reconstruct the content and system, so as to enhance the hardware application ability and practical ability of students of non-computer specialties

We carried out the construction of main-course. There are students of several specialties learning this course, so the emphasis point and class hours are different. How to clip the corresponding contents of the course to make the contents clipped shill self-become system rather than fragmented? And how to make the clipped contents also full of theory and application? It indeed needs research, establishing at the foundation of deeply understanding of the whole course. We have made it. We made a complete, three-dimensional, and connect compact main-course by a series of courses such as Microcomputer Principles and Applications, Microcomputer Interface and Applications and Single Chip Principles and Application. We noticed continuity and systemicness in arranging these courses, not only in the arrangement of teachers but also the syllabus, teaching plan, experiment and design of the courses.

3. Construction of the network teaching resource

In the network teaching resource, we not only need the advanced scientific teaching methods and efficient interactive ways, but also rich practical teaching resource and complete system. According to the properties of information resources itself, teaching resource is not the simple set of the resource already, but a complex system designed carefully by the guild of certain teaching theory, and the standardization criterion of national promulgation. The principles we grasped at the concrete realization include 5 aspects.

First, the construction of network teaching resource database should be prospective. It not only needs to consider practical significance, the development of comprehensive technology related, but also the trend of education development in the future. Then build a prospective teaching resource database which is according with quality education, continuing education, lifelong education, new education.

Second, the building of resource database should be constructive. It must close binding with scientific knowledge; otherwise, it will lose the significance. We should fully consider whether the classification of resource is beneficial to using in teaching and studying, the resource database constructed should not only have enjoyment and practicality, but also elegant browsing interface and resource of practical and effective

Third, the construction of resource database should have nature of construction. Constructivism emphasize both the cognitive active effect of learns and main effect of teacher. Teacher is the helper and facilitator in construction significance, and student is subject of information processing and active constructor of significance. The construction of resource database must protrude the characteristics of double main nature teaching, which is teacher's leading dominant and student's subjectivity. So, in the construction of resource, we need consider whether the resource is beneficial to the teacher to teach, and also the assistance to student's learning interest and form good learning motivation. Through constructing auxiliary situation which is accord with teaching content and the clue between new knowledge and old knowledge to help students construct the significance of knowledge learnt current.

Forth, teaching resource should have the properties of science and education. And it should be objective, scientific. The significance of resource must be considered in the construction, it must be positive to promote the physical and mental development of student, be accordance with the syllabus and course standard, be beneficial to stimulate the motivation and improve the interest of student.

Fifth, there should be good artistry of multimedia material in teaching resources. We usually take attention to the various techniques of expression, the methods of vivid teaching, and the rationality and flexibility of composition, etc.

The building of network teaching resources is envisaged to provide three-dimensional teaching means with perfect function. The primary purpose is to share teaching resources and information associated with efficient teacher-student interaction. It can also help the students obtain the information, solve the problems, exchange experience and expand thinking. Particularly, many things need to be compiled and revised perfectly in advance, such as the introduction and the guide to the curriculum, the syllabus, the teaching plan and the examination methods, etc. Once done, the students will be able to download the resources before class, including teaching plan and lecture notes in detail. The website provides various coursewares, including flash courseware with animation demonstration, PowerPoint courseware, web courseware for self-study in form of HTML, and teaching video taking up 30 percent of total time. There are also exact experiment contents and operation method following the introduction of research topic, with the title and requirements of the course design refined. The synchronous exercise and the self-rated test are offered connected to the teaching plan, with accurate reference answer and simple solution analysis. In addition, examination bank on line can be used by both teachers and students. Choosing the chapters and the difficulty coefficient on line, students may take the exam in the simulation environment momentarily, with the exam paper composed randomly, collected on time and marked automatically. Teachers can remark on the exam paper in real-time by operating the examination bank on line. When the net forum is built, students can ask questions and hand in homework, while teachers can answer the questions, supply counseling, and mark the homework. Lots of other related information will be introduced, such as websites both at home and abroad, the direction of discipline and course, and the news in academic and industry circles. Achievement of all these targets will improve information education to a new level and help to establish a favorable environment, which can enhance students' autonomous and personalized learning and teachers' office automation.

4. Updating teaching methods

Various teaching methods can promote teaching quality, develop students' learning interest, make teaching atmosphere more active, and enhance communication between teachers and students. The teaching group have boldly developed and tried out lots of teaching methods. Expected teaching effect can be guaranteed by classroom instruction, interaction with students, practical training and reasonable examination mechanism. After that, students can consolidate basic professional theory, master the technology of Microcomputer Principle and Application, strengthen practical application ability, and improve innovative consciousness and ability.

Traditional teaching methods and modern multimedia teaching methods can be combined. By traditional methods, teachers usually can adjust the contents and methods to meet the situation of students' acceptation. So students can deepen understanding of the knowledge and arouse enthusiasm. Multimedia teaching is one of the

most important modern teaching technologies. Enormous information is the feature of multimedia teaching. In a very short time, it can provide students much related knowledge around the course, expand students' knowledge range and deepen the understanding. The feature of this curriculum is lots of complex circuit diagram in the course. Multimedia teaching can make the abstract internal structure and data stream more vivid and imaginable, for it is visual and understandability. In a word, these two methods can complement each other efficiently.

Network teaching and traditional teaching should be combined. Course teaching remains the primary theme, and network teaching can not copy the course teaching simply. Network teaching should make full use of network resources and take advantage. By expanding knowledge range, improving the efficiency, and teaching according to student's ability, the network teaching can supplement the course teaching very well. So it is beneficial to help students fully exert subjective activities.There should be flexible examination. Theory course is examined with structural scores, constituted by basic principle and application. Specifically, the basic principle and method may be examined by uniform theory-related examination, and the application can be examined by designable task and thesis. There is course design to improve ability for interface technology and application programming, checked by multi-perspective reply and demonstration.

5. Focus on both administration of teaching process and student's integrated ability

Students should be required strictly to study by three steps: preview, classroom learning with note-taking, and review with programming. Program about application-oriented system design can be arranged to students, then checked and commented by teachers. Teachers should prepare application-oriented lessons based on syllabus, and then teach students in everyday language results of profound substance. Teachers should coach students and answer questions (face-to-face exchange can solve the emphasis and problems, especially, discussing in class can help to settle the doubts and suspicions in time). In addition, homework should be commented and attendance must be checked on to make students go to class consciously. Significantly, students must be required to perform the design and debug the program independently. Teachers can exchange the experience and communicate information among teaching group. Every teaching link and its effect can be ensured to realize by these suggestions above. What is more, the teaching quality and the atmosphere of learning can be greatly improved.

During the teaching of the curriculum, each student who has chosen this course should submit a piece of paper on this curriculum.These papers are not the same as the general ones. Chosen extraordinary carefully, the topics for the papers are at a certain high level and involve the development and application frontier of microprocessor. Meanwhile, we require the students writing the paper according to the standard format for academic papers. That is to say, the paper should include abstract, key words, references, tagging for reference etc. Since the students receive almost little training on this aspect at ordinary times and there is no similar training program on other subjects, we promote this teaching method. According to long-term teaching practice, through this method, students have improved the ability of academic document retrieval and had more profound and complete understanding on the frontier of this field. Moreover, they have improved their academic document writing skill that would be very useful for them to be familiar with research work as soon as possible.

With this teaching method, the course of Microcomputer Principles and Applications is aimed at guiding the students to actively participate in our teaching and research activities, stimulating their interests on microcomputer interface, enhancing their scientific consciousness, improving the ability of absorbing scientific knowledge, and fostering their innovative ability.We also set a lot of fascinating tiny experiment, make and technological invention. Moreover, we encourage our students participating in various competitions such as electronic design competition and robot competition and guide them to prepare for those competitions. Meanwhile, we make full use of the existing resource picking up some of students to take part in our scientific research project. It will lead to an effect on using the experience of one point to lead the whole area to cultivate this portion, that is, more and more students will be inspired to be interested in this course.

6. Effect

Leaded by the aged teacher, the course group make good use of existing Multi-media and network technology etc, processing the curriculum knowledge to be top-quality course through modern technology, providing the students with superior intuitive teaching resources, and have received remarkable teaching effects .

This course was early involved in teaching discussion and research conference both in Sichuan and nationwide. Responded to the convention spirit actively and combined with the course's actual situation in our university, we have got notable achievements. In 1999, we carried out multi-media and 3-dimensional teaching, developed demonstration multimedia animate teaching courseware for experiment course and had received obvious effect. Since 2000, we have expanded network multimedia teaching and developed corresponding network teaching software for this course. The years practical use shows the echo is excellent. Fig.1 shows the investigation about using the network resources by students in last four years. 80% people think it is useful for students.Fig.2 shows the evaluation from students of the course teaching about the six teachers in last four years. From it we can see, the teaching satisfaction degree is improving.
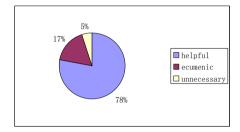

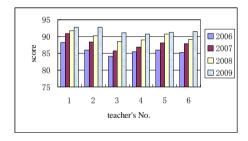Figure.1 Investigation of using network resources by students

Figure.2 Evaluation of teaching quality about teachers

For more than ten years' educational reform and practice, effects indicate that teacher's teaching and design capacity get enhanced; the experiment and design environment building-up are fine; the students' project ability and the ability to innovate get a sharpening. Educational reform effect is in advanced level within the province. According to the survey of most universities on relevance course teaching system, the course teaching thought includes training of the innovating ability with integrating theory with practice. The course has already been judged as province level competitive products course.

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