Design and Teaching Practical Application of Applied and Innovative Curriculum

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Abstract. Taking the course of communication principles as an example, the design and teaching practical application of applied and innovative course are presented. The curriculum design based on CDIO teaching philosophy explains the professional knowledge of communication systems by using BOPPPS, flipping classroom, example of cases and analogy teaching methods. Through teaching practical application, the quality of teaching is improved and students' applied ability is cultured.

Introduction

Instead of teaching professional knowledge of traditional chapters of the course, the knowledge points of the courses are disorganized, analyzed and purposefully integrated into learning situations. Students learn the knowledge through learning situations, in which students practice learned theoretical knowledge and internalize the theoretical knowledge in practice. At the same time, the knowledge that cannot be understood or is erroneously understood is found in practice and can be correctly understood after consulting datum. The students' professional ability, method ability and social ability is trained in the process of course teaching.

Design of applied and innovative curriculum[1] means that applied curriculum adopts innovative teaching philosophy[2] and innovate teaching method, teaching technology, teaching evaluation to design and implement curriculum based on multimedia technology, which benefits improving the quality of classroom teaching, strengthening the construction of classroom teaching, improving the teaching level of teachers, stimulating students' learning interest and realizing the goal of training applied talents[3].

The course of Communication Principle is an important professional basic course of communication engineering. The study of this Communication Principle is the important foundation of the learning of follow up courses. Through the study of Communication Principle, the students are required to master the basic concepts, principles, analyzing method, design and realization of communication systems, understand the development direction and the development trend of the communication system, and learn the new knowledge and concepts of the communication theory. Communication Principle is designed based on CDIO teaching philosophy[4] and explains the professional knowledge of communication systems by using BOPPPS[5], flipping classroom[6], example of cases[7] and analogy teaching methods.

CDIO teaching philosophy refers to the cultivation of students' professional ability of project analysis, design and realization, the cultivation of students' method ability of independent thinking, analyzing, solving practical problems and project implementation and the cultivation of students' social ability[8] of expression, communication and team cooperation and so on based on projects teaching. The CDIO teaching concept is consistent with the applied curriculum to cultivate the students' professional ability, method ability and social ability.

BOPPPS teaching method consists of Bridge, Objective, Pre-assessment, Participation, Post-assessment and Summary that are coordinated, compact, and consistent, so that the teaching process in line with the cognitive law and avoid students are distracted in class and regression in
Design and Teaching Practical Application of Applied and Innovative Communication Principle Curriculum

Design and teaching practical application of applied and innovative communication principle curriculum consists of curriculum objective, curriculum design, the implementation of curriculum reform and teaching practice. Curriculum objectives set curriculum training objectives of applied talent. Curriculum design devises the teaching content of the course unit according to curriculum objectives. The implement of curriculum reform design each learning situation carefully and carry out classroom teaching purposefully. Finally, the application of teaching practice is key and essential. The design and implementation of curriculum units are applied in teaching practice and are revised for students of different majors, so that scientific research results can really guide classroom teaching.

Curriculum Objective

The curriculum objective of applied and innovative communication principle curriculum is intent to cultivate the students' professional ability, method ability and social ability. The students' professional ability refers to students can analysis, design and come true communication system. The students' method ability means independent thinking, analyzing and solving practical problems and implementing project. The students' social ability infers to expression, communication and team cooperation.

Curriculum Design

According to curriculum objective of applied and innovative communication principle curriculum this paper takes communication system as the carrier, deconstructs the subject knowledge and reconstructs the learning situations. Students learn this course through four learning situations.

(1) Taking communication system as carrier

Communication Principle curriculum take communication system as carrier. Learning situations one is operating mode of communication. Learning situations two is analog communication system. Learning situations three is digital baseband communication system. And Learning situations four is digital modulation system. Four Learning situations separately repeat the source, transmission, channel, receiving and signal destination. The procedures are repeated and the content is changed.

(2) Deconstructs the subject knowledge and reconstructs the learning situations

The subject knowledge includes analog communication system, digital baseband communication system, digital modulation system, information and measurement of information, communication operating mode, performance index of analog communication system, performance index of digital communication system, analog to digital conversion, digital to analog conversion, transmission code type, encoding, decoding, modulation, demodulation, etc. The subject knowledge is deconstructed and is reconstructed learning situations

(3) Four learning situations

Each four learning situations is realized by different sub-situations. Learning situations one, operating mode of communication, requires students to complete the experiment of interphone communication and cell phone communication in order to students can understand and master the concept of communication, the definition of communication, means of communication, communication operating mode, the difference between messages and Information, the measurement of information and performance index of communication system.

Learning situations two, analog communication system, demands students to complete the design and implementation of AM broadcast communication system, stereo broadcast communication
system and shortwave radio communication system. Modulation and demodulation are the key professional knowledge of learning situation two and are the basis of subsequent learning.

Learning situations three, digital baseband communication system, consists of bone conduction device and short range data communication system, adding new knowledge point, such as transmission code type, coding, decoding, ADC, DAC and so on.

Learning situations four, digital modulation system, requires students to master ADC, coding, transmission code type, modulation, demodulation, decoding, DAC, the design and implementation of the communication system, by studying the amplitude shift keying, frequency shift keying and phase shift keying of wireless communication network terminal.

Four learning situations can be realized by five steps, source, transmission, channel, reception and destination, which change from easy to difficultly.

**The Implementation of Curriculum Reform**

The curriculum reform of Communication Principle Curriculum is implemented based on CDIO teaching philosophy. The purpose of CDIO teaching philosophy is to cultivate students' ability, including basic knowledge, personal competencies and team cooperation.

Teaching methods adopts BOPPPS, flipping classroom, example of cases and analogy teaching methods. The BOPPPS includes bridge, objective, pre-assessment, participation, post-assessment and summary. Firstly, Bridge adopts flipping classroom centered on students. students explains the teaching case arranged by the teacher in the previous lesson and teacher analyzes the teaching case later to develop the students' ability to learn independently and express themselves. Secondly, Objective lists key points, difficulties knowledge and learning goals. Thirdly, Pre-assessment means asking questions about the contents of each class to understand the students' knowledge that has been learned and to prepare pre-class psychological preparation for students. Fourthly, Participation refers to helping students understand and master the basic knowledge of the project through case analysis under the guidance of teachers. Fifthly, after participation post-assessment checks the students' mastery of each knowledge point by asking questions. Through the learning situation, in the form of group, the students can internalize the teaching contents in "learning by doing" and "doing by learning". This part develops the students’ project implementation ability, the expression ability, the communication ability and the team cooperation ability. Last, the summary is given in the forms of group discussion, project and homework, developing students' lifelong learning ability.

The analogy teaching methods explain the professional knowledge of communication system from shallow to deep through living cases, which is easy to understand and accept for students.

**Teaching Practice**

Design and teaching practical application of applied and innovative communication principle curriculum has really guided teaching in practical. Students show great interest in flipping classroom. It can improve students’ ability of analyzing problems, consulting materials, writing expressing and oral expressing. In participation students conceive, design and realize communication system, it greatly stimulates the students' interest in learning professional knowledge. In a variety of teaching methods, the quality of classroom teaching is improved and students' personal and social abilities are cultivated.

In the application of teaching practice, it is found that students in different majors have different ability to complete their learning situations. For example, students that major in communication engineering are generally more accurate and deeper than those that major in electron information engineering. Therefore, students that major in communication engineering can be asked to design and realize the same learning situation by two methods, and make a comparative analysis of the advantages and disadvantages of the two methods, so as to cultivate the students’ ability of thinking and explore their potential. In addition, the learning abilities of students of different grades in the same major are slightly different. The number and difficulty of learning situations should be changed according to students of different majors and grades.
Summary

Design and teaching practical application of applied and innovative communication principle curriculum develop students' abilities based on CDIO teaching philosophy. BOPPPS teaching method is adopted to enable students to learn effectively. The flipping classroom takes the students as the center. Adopting the case teaching, the actual cases are turned into the teaching problem. It is easy for students to understand professional knowledge by analogy teaching methods. In the innovative, rigorous process of teaching, curriculum training objectives is completed and applied talents are cultured. The application of teaching practice is the only way to test whether design and teaching practical application of applied and innovative communication principle curriculum is reasonable or not. The well-designed application of applied and innovative communication principle curriculum is really carried out in the classroom teaching, the teaching results for students of different majors and grades are analysed, and the design of curriculum unite revised and implemented according to the students' learning ability, so that the results of scientific research can really guide the teaching.

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