

Reform of Teaching Methods and Approaches of Optoelectronic Information Material Professional Courses Based on CDIO Mode

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Abstract— Elaborate the exploration of modern teaching methods and approaches in teaching activities of optoelectronic information material professional courses in higher education. Shortages of traditional teaching methods and approaches were explored, formation of innovative teaching methods and philosophy were discussed, implementation effects of innovative teaching methods and approaches were analysed, and the technology of making modern courseware, website and examination database with using modern information technology were also discussed.

Keywords- *teaching method; teaching approach; teaching reform; institutes of science and technology; professional course*

Teaching methods and approaches are the most fundamental organizational form of teaching, embodiment of higher education thoughts and philosophy and intermediary of teaching subject and object in teaching activities in regular institutes of science and technology. It directly determined the education of learning ability, innovation ability, collaboration ability and practical ability and it is the most basic condition of teaching quality guaranteeing. Reform of teaching methods and approaches is the footing of training talent mode reform^[1], and also the emphasis and difficulty of teaching reform. Teaching reform of methods and approaches of professional courses of inorganic nonmetallic material specialty was tried based on its qualifications and social practical needs for promoting teaching reform of undergraduate professional courses in regular institutes of science and technology^[2], improving teaching qualities of undergraduate professional courses, driving modernization of teaching methods of professional courses and make them more advance and scientifically reasonable^[3].

I. SHORTAGES OF TRADITIONAL TEACHING METHODS AND APPROACHES

Traditional teaching mode of professional courses in regular institutes of science and technology in our country was: one chalk, one blackboard, one teacher and lots of students, the teacher taught in front and students attended below, just like that the teacher was performer and students were audiences. It showed as a single teaching method which centered on teacher, book and class, fundamentally was a teaching mode of “cramming” and “chalk talk” which subject was teacher and objects were students. The teachers focused on knowledge amount they told the students, filled the students’ mind with ready-made knowledge and asked

the students to calculate and learn the previously knowledge, teaching results and students achievements were all measure with the amount of knowledge memory. The students aspired the standard answer which came from the teacher and books, they had no opportunities to ask questions in class and were trained with the teaching mode of convergent thinking. Students will lack enthusiasm in learning, spirit of thinking and doubting with this teaching mode, and then drop their learning ability and suppress their innovation ability. It lacks people-oriented spirit and can not catch up with the technology development with using the teaching mode which focusing on teaching and forced learning.

There were some problems in traditional professional course teaching: traditional teaching content, less targeted and too wide content and too much basic theory, it could not make adjustments with the development of technology and lack support of modern teaching techniques and approaches.

Traditional teaching method depended mainly on wall map and naïve model. CAI teaching function could not be full played, applications of computers and internet were very low and there were serious defects in software and hardware for financial constraints and backward in teaching approaches, techniques, equipments and environment. And with the wasting of time and energy to make excellent electronic courseware, application of multimedia courseware was limited and could not meet the requirements of teaching.

II. Formation of Innovative Teaching Methods

Reform of teaching methods should submit to train professionals and aim at improving the teaching quality. On the existing issues, a innovative ideas were suggested: serve, guide, interact and the innovative idea of theory teaching directly contact with practical teaching, encourage interaction between teachers and students with the students as subject and teacher as the leading, so it can highlight the teachers’ role of guiding and serving, encourage the dependent learning of students and train them the explorative learning ability. Shift to a modern teaching approach and mode which pay attention to not only the learning results but training students the learning process and methods. Break the traditional teaching mode, reform the teaching methods boldly and adopt more modern teaching mode of discussion, heuristic, documentation, experience and question-answer teaching or observation,

multimedia, on-site and interact teaching. Meanwhile, closely rely on enterprises, strength communication and contact with them and listen to their views and recommendations about personnel training. Then adjust the teaching plan timely, adopt the dynamic teaching and managing mode in teaching plan and manage, revise the professional course system and teaching assessment system, accordingly modify the teaching plan and syllabus and set professional course design specification, production practice, graduation thesis syllabus and experimental instructional guide of optical fiber and cable^[4]. In professional course teaching, teachers are asked to prepare well the lesson, keep stock and fresh, revise teaching plan continuously, reject the outdated content and supply new technology and knowledge.

Modern teaching method of discussion, heuristic and multimedia is the carrier of reform^[5], its construction can promote teaching method change gradually: teachers play the leading role and students play the subject role replace the teacher centered phenomenon; transform from pay attention only on learning results to both learning results and learning process and methods, and from research only teaching method to both teaching and learning method, proactively get acquainted with the learning characteristics, research learning process and method of students, and research law and improve teaching method in order to accomplish the prescriptive teaching goal.

For improving the learning initiative and creativity of students and for most of them to accept, a suitable and effective method should provide to each course. In teaching method reform, method of question-answer and two-way communication should be alternate adopted appropriately. Some open content should be set in teaching process in order to not leave students full point but question mark such as unsolved problems in the field, being explored projects and gaps between our country and other advanced countries for the course is the professional course of senior students.

III. Implement of Innovative Teaching Methods

Reform of teaching methods express in training students innovative awareness and practical ability. With the principle of speciality subject to enterprise and courses subject to speciality, and with the curriculum system and content, reform of methods and approaches as emphasis and breakthrough, according to development technology, organize teaching with the principle of applicability and practicalness, it should highlight the applicability and pertinence and express the utility, comprehensiveness and leading edge. Any type of teaching methods and approaches should be used flexibly and collaborate with each other, they have no obvious distinctions but unify in modern teaching art, aim at improving the teaching effect and quality.

A. Application of Modern Teaching Technique

In teaching process of professional courses,

intensifying teaching effect and improving teaching efficiency had build a striking success for making full use of modern teaching technique and source material such as objects and pictures which have advantages in teaching process compared to traditional teaching methods. For internet and multimedia can make up the insufficiency and flaw of classroom teaching, CAI multimedia courseware, corresponding examination and quality course website of optical fiber and cable production technologies, optical fiber communication technologies, physical chemistry, powder engineering and inorganic chemistry had been developed timely based on material warehouse with using modern information technology, in order to cooperate with teaching of professional courses.

B. Innovation of Practical Teaching

Each course has its essential practice and there were three in our course which were production practice, curriculum design and graduation thesis. Meanwhile, in order to change the complete disjunction between class teaching and extracurricular technology activities, we will guide and organize various kinds of extracurricular scientific and cultural activities, reading and research activities and make them combine with the classroom teaching. If conditions permits, we suggest to establish the "Project" or design topic, and organized research and practical activities with students as subject. Students who has excellent achievement of curricular design and "Project" can apply for defense and it can substitute for "engineering training" in undergraduate level or increase 1-2 credits.

Large amount of students, strong self protection of enterprise and deficiency of practical teaching source were main problems in optical fiber and cable professional courses teaching. Expect experimental teaching and practical teaching, teaching methods and approaches which were internationally compatible such as co-constructed practical teaching base with relevant enterprises (Harbin Cable Factory, Anda Lida Cable Material Factory and Jiangsu TongDing Optic-electronic CO. LTD), run opening experiment which expressed the combination between theory teaching and practical training and train practical skills with five students as a group were also adopted and applied flexibly for each student could get a integrated and equitable educate^[6].

C. Opening Professional Practical Teaching

Opening experimental teaching platform have been set with the title of Study on preparation and microstructure of Cu-Cr/SiO₂ for the sophomore and junior students could know about specialty as soon as possible.

Opening experimental teaching platform focused on fusion of different kinds of subjects and expressing of subjective initiative of students. It encouraged students asking and doubting, generally no ready answer and specified experimental procedure were provide to students, but leave them more broader thinking and experiment space

with some kind of fuzziness and uncertainties which was flexible, thus could encourage them think and explore persistently, then innovative ability, practical ability and comprehensive ability of them could also be trained in this process^[7].

IV. DEVELOPMENT AND APPLICATION OF MODERN TEACHING METHODS AND APPROACHES

Teaching methods must integrate with teaching content closely. With effective modern teaching method, teaching content would get a full explain and much information would be provided to students within the time, then best teaching effect could be obtained.

A. Development of CAI Multimedia Courseware

Multimedia CAI technology was designed for accomplish the teaching plan, it needed not only the consideration of the teaching characteristics and function but also the organization and usage of all kinds of media, so its accomplishment was based on the cooperation of experienced teachers, computer technicians, educators and art designers. Development of optical fiber and cable production technologies, optical fiber communication technologies, physical chemistry, powder engineering and inorganic chemistry CAI courseware^[8] were all based on Windows 98 and Windows 2000 operating system, mainly used advanced and resourceful videos and audios of Macromedia company, multimedia programming with Authorware7.0 which could integrated manufacture visual medium, graphic design with CorelDRAW10 and GIF animation with ImageReady7.0 of Adobe company. Optical fiber and cable production technologies as one of the forerunners of professional CAI courseware, it aimed at popularizing professional CAI courseware, making students who majored in relevant specialty and people who interested in optical fiber and cable production understand and learn this course and making more people understand professional knowledge about new inorganic materials, it has great practical significance.

B. Teaching Website Construction of Quality Course of Optical Fiber and Cable Production Technologies

Teaching content of quality course could be browsed, played and downloaded though the website of quality course of optical fiber and cable production technologies^[9], it could also realized the interactive teaching and communication between teachers and students. Teaching content and web pages were integrated with iframe in the website, requisition form of quality course could be browse online.

Overall structure of website: HTML web pages constitute the website and with table as its basic structure which contained the DHTML iframe. The homepage divided in two parts, the upper one has twelve first level menus which contained the main menus of application materials, teaching staff, teaching content, teaching conditions, teaching methods, teaching effect, website

teaching, homework, experimental guidance, features, relevant fields and so on. The underpart contained course description and campus animation, there were pull-down menus in its main menu.

C. Examination Database of Optical Fiber and Cable Production Technologies

Development of examination database of optical fiber and cable production technologies^[10] was based on VFP technology which organized the database and table modules needed for development of application with its project manager and a executable file which could run under windows could be obtained.

This examination database have been used in first term final exam of 07-10undergraduates who majored in optoelectronic information material, it has got a ideal effect and meet requirements of original design, acquired a maximum satisfaction of teaching demands.

V. TEACHING EFFECT

Construction and reform achievements of optoelectronic information materials obtained through years of teaching construction and reform showed as bellow.

A. Reform of curriculum manage system, teaching content, methods and approaches and assessment mode have been implemented, best textbooks at home and abroad have been selected.

B. Construction of material storehouse of professional courses of optoelectronic information material have got some phase achievements, three-dimensional animations, pictures, courseware, teaching website and real products have been developed.

C. Practice base with laboratories have had a certain size with engineering environment

D. Reformed the practical teaching and took graduation thesis, curriculum design, production practice and opening experiment as the practical training of professional courses of optoelectronic information materials, highlight the training of professional skill and practical ability.

We will take construct, implement and maintain the quality course of optoelectronic information materials as key construction objective, increase its construction, improve overall the course quality and try our best to take the teaching effect to a higher level.

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