

The Reform and Practice of “Web Application Development” Course Based on CDIO Model

^aLiu Lina, ^bLi Dexiong

^{a, b} *Department of Information Engineering Shijiazhuang Institute of Railway Technology
Shijiazhuang, China*

Abstract

By learning advanced CDIO model of engineering education and analyzing the problem of traditional “Web Application Development” teaching, we try to apply CDIO model to the teaching of “Web Application Development”. Taking the projects as a vehicle, the article puts forward some concrete reform measures from organization of teaching, teaching methods and assessment mode etc. After practicing, we get an ideal result.

Index Terms: CDIO; learning by doing; item teaching

© 2011 Published by MECS Publisher. Selection and/or peer review under responsibility of the International Conference on E-Business System and Education Technology

1. Introduction

With the rapid development of software industry, businesses have put forward a higher requirement to overall quality and their innovation ability of software talents who were cultured by higher education. Traditional teaching models and teaching methods has been difficult to adapt to the new requirements on the human capacity and quality which today's software companies put forward. Personnel training need urgently be connected with business closely. The reform of software training mode has been imperative.

CDIO is an innovation model of international engineering education and personnel training, and has been widely recognized and positive response by domestic and international engineering education. This paper is based on CDIO model as a guide, combined with the course of "Web Application Development" taught by the author and primarily aimed at the exploration and practice of teaching reform.

Corresponding author:

E-mail address: ^ajsj_lln@126.com ^bjsj_99131@163.com

2. about cdio

CDIO, which was developed by MIT, Chalmers University of Technology, KTH and Linköping University, is an innovative engineering educational framework. CDIO stands for *Conceive – Design – Implement – Operate*, and is a complete lifecycle from conceive to run of modern industrial product development. CDIO engineering education philosophy is carried by this process to allow students to learning engineering by initiative, practical method, at the same time, trains student engineering capability. This capability includes not only the individual's academic knowledge, but also student's life-long learning capability, teamwork and communication capability, and system control capability.

CDIO model emphasizes an integrated innovation and harmonious development of social environment, while also concerned about the practice; enhance the practical ability of students. It's a generalization and abstract expression of “learning by doing” and “item teaching”. The demand of CDIO model is made by referencing to the needs of engineering. And the need will be realized through syllabus and teaching plan. In each course as well as each teaching session, the capacity requirement of industry should be implemented. CDIO aims at training engineers who have professional skills, social consciousness and enterpriser's acumen.

3. Survey of “WEB APPLICATION DVELOPMENT” COURSE

“Web Application Development” course, which centered on Web development, integrated high-level programming language, database technology with web design skills, is a required course in computer-related professional. It has distinct practical application and practicality. The course teaches students with C# experience the fundamentals of Web application site implementation using Microsoft ASP.NET. The class focuses on using the Microsoft Visual Studio .NET environment and the Microsoft .NET platform to create an ASP.NET Web application that delivers dynamic content to a Web site.

The traditional teaching model of “Teaching in classroom & Practicing in computer laboratory” has many shortcomings. It can not adapt for the new requirements of enterprise on quality and ability for personnel. First of all, “Teaching in classroom” is based on teaching. The teacher is subject. This leads to that students do not have the opportunity and time to think independently. Thinking process of teachers has instead of thinking process of students. So students lose their opportunity and process of explore. “Practicing in computer laboratory” gave students an opportunity of hands-on experience through a series of practical tasks, but it is separated from class teaching. That knowledge and skills learned can not be consolidated in time greatly weakened the effectiveness of teaching. In the next place, through the traditional teaching model, the student abilities of learning, teamwork and communication can not be trained and exercised.

4. The Reform and Practice of “Web Application Development” Course

Because traditional teaching model of “Web Application Development” course has many shortcomings and is difficult to meet the national training goal of creative talents, we carried out teaching reforming based on CDIO model. We focus on training students to analyze and solve practical engineering problems, and enable students to learn with the pursuit of solving engineer problems. The teaching reforming measures are as follows.

4.1 Project-based learning

CDIO requires students to learn and practice based the lifecycle of engineering project, which is carrier of imparting basic knowledge and skills. Combined the course objective and characteristics of “Web Application Development” with the actual situation of students, we designed a project as a carrier of the course. The task of this project is to develop an integrated business website which includes news management subsystem, message management subsystem, product distribution subsystem, membership management subsystem and BBS subsystem, etc.

At the beginning of “Web Application Development” course, the task list will be assigned to students. Much independent knowledge which looks more intricate can be associated by the project. We try to enable students to

experience themselves the whole process of developing software, from conceiving, designing, implementing to operating, grasp the involved knowledge, skills and methods of solving problem. The actual work drill in teaching integrates abstract knowledge with actual work. This can greatly waken students learning interest and potential, improve students’ practical ability, and cultivate a comprehensive professional quality.

4.2 The Reform of teaching Form

In order to fully implement the advanced CDIO engineering education model, the whole implementation process of “Web Application Development” course is be in multimedia software training room. It comes true and provides strong support for “learning by doing” that theoretical teaching is closely combines with practical teaching.

Based on the student’s actual situation, the form of group can be considered. Several students make up a project team whose schedule is arranged by group leader. This form of group can train students’ collaborative spirit, communication capability and leadership.

Based on CDIO model, we complete the task of curriculum in four stages that come from software engineering process. The four stages are needs analysis, design, implementation, test and maintenance.

1) *The stage of Needs Analysis(C)*: Need analysis is the first step of starting a project. At this stage, students must accurately determine “what the end product must do”. The main function of this stage is to enable students to clear the tasks of course project.

2) *The stage of Design(D)*: This stage falls into two stage: constructional design and detailed design. The general solution of system including module structure and database structure must be determined at constructional design stage, and the detailed solution must be given at the detailed design stage. The main function of this stage is to enable students to clear “how to do”.

3) *The stage of Implementation(I)*: The task of this stage is to complete the project according to the established objective and the designed methods. This is the center stage of the course. At this stage, students can master the nuclear knowledge and skills.

4) *The stage of Test and Maintenance(O)*: The task of this stage is to test the project after it has been completed in the main and maintenance the project if some errors or shortcoming has been found.

4.3 The Reform of Teaching Methode

In the teaching process, we link the teaching of classical appreciation, knowledge explanation, operation practice and actual project operating together. It constitutes a new chain of modern teaching of combination of theory and practice, combination of classroom teaching and extracurricular teaching, combination of teaching projects and practical projects.

1) *Item Teaching Approach*: Item teaching is a new teaching approach by that the projects were links with basic knowledge. Learning as operating stimulates students’ interest in learning, improves students’ ability of analyzing and solving problems, makes student learning easily and independently.

The complete practical projects, “Development of an Integrated Business Website”, is been done from beginning to end. The knowledge and key technology of web design and Web application development were been explained throughout the project. Item teaching approach fundamentally fuels the positivity and initiative of the student, improves students’ ability of learning, practice and creativity effectively.

2) *Case Teaching Approach*: The actual case is been into teaching system. And each knowledge is been combined with actual application. For example, when we explain APPLICATION, students learn its characteristic and usage through an actual case of chat room.

3) *Extracurricular Teaching*: In addition to limited classroom teaching, we also carry out extracurricular teaching through the website of the course. There is a network resources database on the website, including teaching resources, project resources, classic cases, practice question bank, etc. Moreover, website also has online tests, online tutorials, technical discussions, technical manuals, etc. The website of this course allowed students to learn, discuss, and search information to solve problem online in extra curricular time. It can not only enhance learning efficiency and interest in learning of students, but also increase the amount of information of the course.

4.4 *The Reform of Assessment*

Course assessment is conducted by project team as a unit. The course grade for each team judged according to three aspects, the first ones is regular grade (20%), which is assessed mainly from the attendance, teacher-student interaction, group discussions, work attitude, team collaboration, etc. The second is project grade (50%), which is assessed mainly from function, performance and quality of project, interface and code of system, etc. Each production will be showed and explained by the delegate who is elected by their project team. This way allows students to learn each other in competition with each other. The last one is defense grade (30%), which is assessed mainly from the understanding and applying to knowledge, the verbal ability, etc. The teacher is in charge of organizing defense and questioning for the project. The student who replies on behalf of the staff team is determined by drawing of lots. The defense performance of the delegate decides the base grade of the team, this will ensure that each member must fully grasp the project overall. According to the quality and the size of his contribution, each member's grade in the team is the team's base grade multiply by an appropriate weight.

This assessment method can increase students' responsibility and collective consciousness, and can help students to improve much professional capacity of teamwork, communication, language. In this assessment method, the students will be assessed throughout the whole teaching process, this will lead students to value each teaching step, and help students improve learning consciousness and initiative, and enhance the teaching effectiveness significantly.

5. conclusion

By applying CDIO model to "Web Application Development" course, we have achieved good results. It not only help students in mastering basic professional knowledge and skills, but also increase students' interest in learning and enhance the qualities required by practitioner. The successful experience of domestic and abroad has showed that the philosophy and method of CDIO "learning by doing" is advanced, feasible, and entirely appropriate for the teaching process of engineering education. In the future, we will continue effort to improve every detail of the curriculum reform, to train more software professionals with practical and innovative capability for industry.

References

- [1] Bergren K. F., Doris Brodeur, Edward F. C., Ingemar I., William T.G., Johan M. & Soren O. "CDIO: An international initiative for reforming engineering education. *World Transactions on Engineering and Technology Education*", Vol.2, No.1, pp.49-52, 2003.
- [2] Kenneth Bjerner, Sten Granath. "Development of Three Bachelor Programs At Linkoping University According to CDIO". <http://www.cdio.org>.
- [3] Zhajianzhong, "Strategy of Engineering Education Reform in the Era of Economic Globalization", *Research in Higher Education of Engineering*, 2008(1):21~28 (in Chinese)
- [4] Zhajianzhong, "On CDIO Model under "Learning by Doing" Strategy". 2008(3):1~6 (in Chinese)