HIERARCHICAL CONSTRUCTION OF TEACHING FACULTY IN COMPUTER ORGANIZATION AND DESIGN

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Abstract: With the rapid development of computer hardware, computer architecture and organization becomes more and more important for the student to enter the computer world. It is a great challenge for the teaching faculty not only inherits classical teaching materials but also keep up with the world trends. In this paper, we present a hierarchical construction of teaching faculty in course of "Computer Architecture and Organization". Both the methodology and implementation is included to show how our design works. The achievement we get recent years show that our teaching faculty's effort leads to a satisfied result and keeps a health development continuously.

1 INTRODUCTION

With the development of computer science, computer education meets great challenges to keep up with the world trends. Many new courses have to be designed according to the latest computer technologies. However, there are many basic courses that keep in the history of education of computer science. Computer Architecture and Organization is one of them. It's one of the basic courses of computer science and showed in the Joint IEEE Computer Society/ACM task force on the "Model Curricula for Computing" (CC). Both CC2001 (CC2001, 2001) and CC2005 (CC2005, 2005) showed that the Computer Architecture and Organization is one of the required course.

Basic principles about the architecture and organization of a computer occupy a place in the core of most computing curricula. (Cassel et al.,) said that these topics must be taught as basic knowledge of computer hardware, since computer architecture has great impact on both the hardware design and the software design. Also, there are wide variations in the expertise and interests of faculty assigned to teach them. Some faculty who teach these subjects are deeply involved in the topic areas, others have substantial experience but a different primary focus, and still others are clearly teaching outside their area of experience and expertise. In all cases, the faculty are challenged to remain current in the topic and to address

both the fundamental principles and ramifications of recent developments. Though this course has a long history, how to keep the teaching faculty well prepared to meet the challenges remains a big problem in the construction of the teaching group.

In this paper, we present a hierarchical construction method of teaching faculty in Computer Architecture and Organization. Both the methodology and the implementation of the hierarchical construction are discussed in our paper. The design is already applied in College of Computer Science of Zhejiang University and achieves success in real world.

2 BACKGROUND

Computer Architecture and Organization is aimed at teaching the fundamentals of the computer organization and design. Upon completion of this course, a student should be able to explain the operation of a CPU, understand the merits of virtual memory, cache and interrupt system, and analyze the fundamentals of I/O system. The emphasis of this course is on the basic issues of computer organization and computer design. Computer organization is concerned with the way the hardware components are connected together to form a computer system. Computer design is concerned with the development of the hardware for the computer taking into consideration of a given set of

specifications. In this course, students will learn the principle and hardware implementation of computer components, and how to completely design a correct single processor computer.

The course "Computer Architecture and Organization" starts in early 1978 in Zhejiang University. The web side of the course is opened in 2000 (ZJU.,). The teaching faculty is combined with 9 professors and 36 lecturers. Most of them come from System and Architecture Research Institute of Zhejiang University. The construction of the teaching faculty will guarantee the sustained development and innovation of the education system. Hierarchical construction is our main guidelines. Method such as feedback system and training program are parts of the hierarchical construction system.

3 METHODOLOGY

3.1 Hierarchical Age Distribution

The age distribution of teaching faculty is one of the important issues of the faculty construction. Since teachers with different ages are different from their education, teaching style and so on. Main differences from young teachers and experienced teachers are showed in Table 1.

Table 1: Comparsion of the young teachers and the experienced teachers.

	Young teachers	Experienced teachers
Strength	*Fast learning	*Full of teaching experience
	*Knowledgeable on new technologies	*Systematic teaching method
Weakness	*Lack of teaching experience	*Knowledge structure is relatively old

Figure 1 is the hierarchical age structure of our teaching faculty. Here we define two flows: knowledge flow and experience flow. Knowledge flow indicates the new technologies that the young teachers may obtain and will pass to the faculty. Simultaneously, teaching experience pass down from the experienced teachers to the rookies. Middle layer is the middle-aged teachers whose properties are between young and experienced teachers.

3.2 Hierarchical Training Program

Training program is a part of our hierarchical construction methodology. The training is not only for young teachers but also designed for experienced
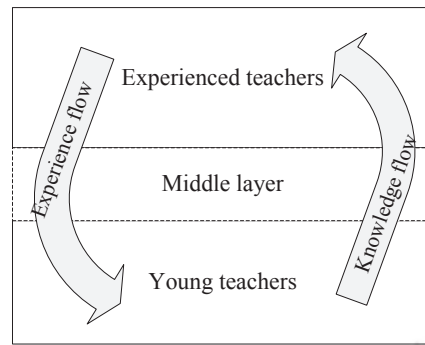

Figure 1: Hierarchical age structure of our teaching faculty.

teachers. Since the young and experienced teachers are different as showed in Table 1, we should design different training programs to meet different requirements. Figure 2 gives the structure of our hierarchical training program. The training program is divided
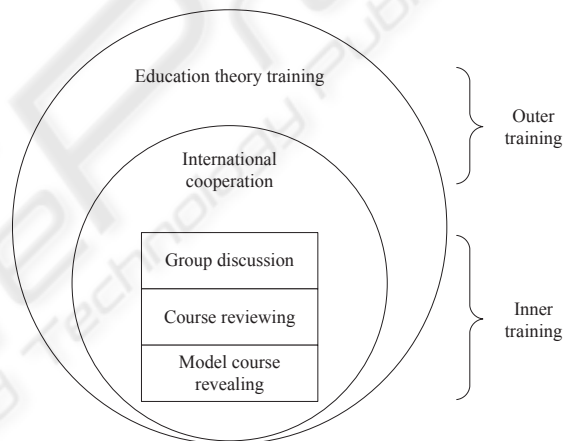

Figure 2: Hierarchical training program.

into two parts. The inner training is the basic program.

In next section, we will present the implementation of our methodology on our practice of the course on Computer Architecture and Organization. Besides, achievement we get will also be included.

4 IMPLEMENTATION AND ACHIEVEMENTS

4.1 Hierarchical Construction

Our teaching faculty are most from System and Architecture Research Institute of Zhejiang University. 9 professors with 36 lecturers construct the teaching team of the course. The age distribution is showed

in Figure 3. Teachers older than 51 years old are defined as experienced teachers and the teachers under 35 years old are young teachers. By this division, the experienced teachers occupy about 26.3% of the faculty while the young teachers are 36.7%. The middle aged teachers occupy 36.7%. The age distribution is balanced and hierarchical. Among the faculty, professors, associate professors and lecturers are assigned to cooperate. The distribution is showed in Figure 4. The distribution is 26.3%, 42.1% and 31.5% for professors, associate professors and lecturers respectively.
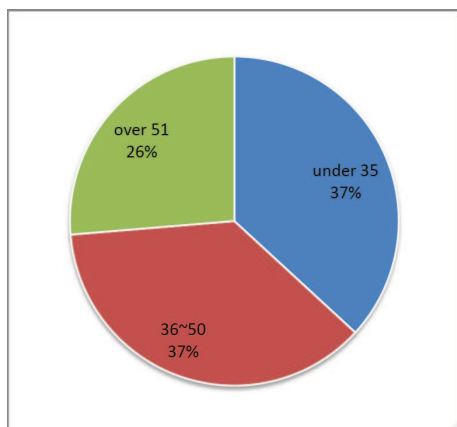

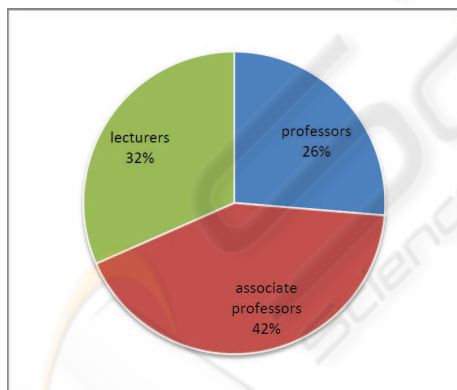Figure 3: Age distribution of our teaching faculty.

Figure 4: Title distribution of our teaching faculty.

4.2 Training Program

4.2.1 Model Course Revealing

With the efforts of our faculty, the course on Computer Architecture and Organization is assigned State-level Courses. The model course can be accessed on the internet. Both teachers and the students can learn the course through the web page. Videos of real teach-

ing procedure are presented not only for student to do the remote education.

4.2.2 Course Reviewing

The course reviewing system is designed for helping the teachers to get the feedback from the experienced teachers or experts. We offer this opportunity for any teacher in the team. Every teacher will give an open lesson. We will set up an expert team to attend the lesson.

4.2.3 Group Discussion

Group discussion is an easy way for the teaching faculty to share their experience and ideas. Our teaching faculty are divided into several small groups. Every group is composed with young teachers, middle-aged teachers and experienced teachers. Every group will have a short discussion once a week. The content is not fixed. Every half semester, there will be a conference for all the faculty. Every group will give a standardized report to share their achievements.

4.2.4 International Cooperation

In order to keep up with the newest achievement in the world, our team cooperates with foreign universities, as well as companies. Foreign universities will share their education experience with us. And communication with the companies will help our teachers to enhance the understanding of the industry world and minimize the gap between the education and the actual needs. A lot of famous lectures and researchers are invented to our university.

4.2.5 Education Theory Training

Refining the theory is very important in education. Our team not only pays attention to the education practice but also to the refining of the theory. We have published a lot of education papers on both domestic and international conferences and journals. By the year 2008, we have published 24 research papers on the education of Computer Architecture and Organization. Besides, our faculty attended the international conferences not only to learn from the educators but also to share our achievements. We also hold an international workshop on 2008. It was the first International Workshop on Computer System Education and Innovation (IWCSEI 2008).

4.3 Course Feedback

In order to measure the result of our courses, we developed a feedback system to let the student to make

the evaluation. Our feedback system is based on internet. Student can make their comments both on the course design and content but also the teachers. We designed several questions for the students. Figure 5 and 5 shows the result of the feedback from the students. In Figure 5 listed satisfaction of the students of
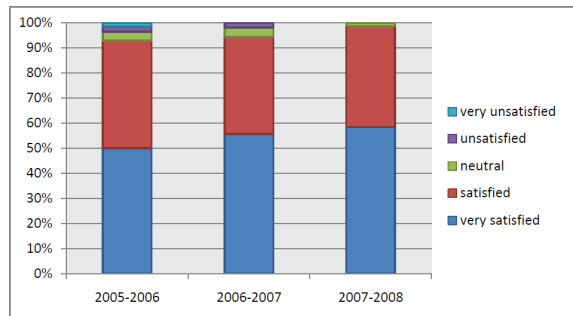

Figure 5: Satisfaction of the students.

the course from 2005 to 2008. The satisfaction ratio is about 95.2%. Detailed score is showed in Figure 6.

We list 8 questions:

QA: Teaching style is serious and responsible.

QB: Teaching expression (oral, writing) is clear.

QC: Teaching content is advanced, proper arranged and focused.

QD: Using advanced teaching methods

QE: Heuristic teaching.

QF: Gain much during the course.

QG: Satisfaction with teacher.

QH: Teaching materials is suitable and with high quality.
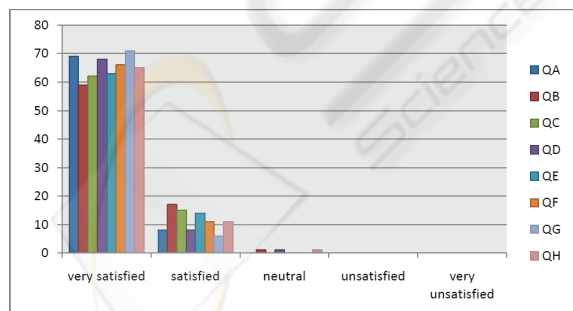
These questions are designed to evaluate the effect

Figure 6: Detailed feedback from the students.

of our teaching. Figure 6 is the result we get from 2007-2008. The average satisfaction is 99.5%.

5 CONCLUSIONS

With the development of computer science, computer architecture and organization changed a lot. The education on such a topic should not only keep the classic theories but also absorb the newest technologies. A health construction of the teaching faculty will keep the team keep being improved. In this paper, we present our Hierarchical construction of Teaching Faculty in Computer Architecture and Organization. Hierarchical age distribution and hierarchical training program are our main methods. During the implementation, our methods achieve great result. Most students are satisfied with our course. Research papers on education are published. We also invent experts from both the foreign universities and companies. International communication is made through attending international conferences and holding a workshop on education.

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