An Exploration on Teaching Team Construction of Computer Software in Application-oriented Undergraduate Universities

Chaoxiang Chen, Binbin Zhou
College of Information Science & Technology
Zhejiang Shuren University
Hangzhou, China
e-mail: ccx0725@126.com

Abstract—This paper analyzed the contradictions between requirements for computer software talents in application-oriented undergraduate universities (AOUUs) and current teaching status. We also discussed the necessities of teaching team construction for computer software specialties based on university-enterprise-cooperation (UEC) in AOUUs. We proposed the construction principles and explored the organizational forms and construction methods of UEC-based teaching teams of computer software.

Keywords- application-oriented undergraduate universities; computer software; teaching teams construction; university enterprise cooperation

I. INTRODUCTION

In recent years, the universities adjust their talents training objectives in time as application-oriented talents, keeping up with the development of the society and economy. In this case, the teaching staffs are required to be double-qualified. On the other hand, in order to improve education levels, a number of universities employ teachers with Doctor Degree recently without working experience. However, there exists a barrier to train advanced application-oriented talents due to a lack of advanced application-oriented teaching staff.

Ministry of Education has launched an undergraduate education program in early 2007, named as *Teaching Quality Program*. A key part of this program is the construction of teaching teams and high-level teaching staffs. A number of scholars, including teaching administrators and teachers have paid efforts on theories research and construction strategies of teaching teams. Ma [1], Liu [2], Zhang [3] et al. have analyzed the teaching team construction in ordinary undergraduate universities, such as the contents, objectives and construction strategies. Numerous discussions focused on teaching team constructions in public universities have been proposed in education journals, with all types of specialties and curriculums, particularly in higher vocational schools. Xu [4], Hu [5] et al. have made some contributions on teaching team construction in higher vocational schools. Moreover, Hu [6], Tao [7], Chen [8] et al. have proposed a number of strategies and solutions for teaching team construction in computer-related specialties. In this paper, we proposed lots of specific ideas for teaching team construction based on university-enterprise-cooperation (UEC) in computer software education, and made a successful practice in Zhejiang Shuren University.

II. COMPUTER SOFTWARE TALENTS REQUIREMENTS AND TEACHING STATUS

Currently, there exists a wide gap between computer software graduates and the information technology outsourcing (ITO) enterprise's actual demands. The enterprises have to spend 6-12 months and amounts of cost training the graduates to be capable to start their careers. Compared with the enterprises' demand, there are several problems in teaching teams when training traditional computer software talents.

At first, they pay more attention on theory research rather than practice and application. With the burgeoning of information technology, there are lots of computer software technologies emerged which requires teachers to update their teaching contents with the technology develops. At present, a large number of teachers focus on theory research rather than taking part time job of technicians in enterprises. Meanwhile, due to the lack of actual engineering experience, the teachers are not familiar with the novel technologies used by the enterprises. Therefore, it makes teaching materials, curriculum objectives, syllabuses and teaching contents broke away from enterprises' practical demand of. The update of teaching contents cannot satisfy the development demand of technology, which would block the application-oriented talents training seriously.

Secondly, they prefer theoretical teaching to practice training. In China, teaching staffs always focus on discipline theoretical systems and completeness of knowledge systems. Meanwhile, they pay less attention on students practice abilities training. In fact, they always teach some theories in class and leave the practice part for students on their own, which actually will limit the training of students' practice ability, due to a lack of teachers' guidance and monitoring on practical teaching. Currently, teaching materials used are always classical and mature, which generally cannot catch up with the development of technology. However, IT industry appears recently as a new technology industry and enterprises mainly use novel technologies. In addition, ITO talents mostly devote to project development, testing and maintenance. On the contrary, the conventional teaching methods obviously cannot make graduates adapt to demands of enterprises, because the methods emphasize infusion and teach from the beginning to the end rather than practical program teaching.

Last but not least, the teaching staffs put emphases on knowledge instruction than occupational accomplishment education. Currently, most teachers attach great importance to their specialized courses but believe ideological and political education is only the category of ideological and political course. However, ITO professional morality and occupational accomplishment have their own specialization, that education and teaching should develop based on their professional foundation. For example, the professional morality problem taken place in the development of system development and data maintenance is difficult to carry out in lower grades' ideological and political courses. Conversely, it only can be carried out by professional teachers and program managers from enterprises in high grades. Moreover, the communication ability of software development, testing and software maintenance, and the team spirit can only come into effect in high grades through the teaching of program development and management and learning by doing.

III. NECESSITY OF UEC-BASED TEACHING TEAM CONSTRUCTION OF COMPUTER SOFTWARE SPECIALTY

A. Necessity of application-oriented talents training

The talents training target of computer software in AOUUs general oriented in application talents, which means the practical teaching need to be enhanced. At present, most teaching staff engaged in teaching once they obtained their Master Degree or Doctor Degree, lack of practical experience. The teaching team construction can combine relevant teachers with different academic background, different theoretical and practical abilities, and introduce engineers with abundant experience into teams, to improve students' practical abilities effectively. On the other hand, it is its own demand of computer software specialty. The technicians are more familiar with the latest technology, so that they can bring them into the class for the students, which can increase their learning efficiency. Furthermore, the characteristic of this specialty is strongly continuous. For instance, about the programming, the curriculums from programming basis to object-oriented programming are linked closely to form a chain. The teaching team construction can be beneficial to the communication of relevant courses, teachers' teaching and students' study, which can lead to an improvement in teaching effect.

B. Satisfication of the lack of High-level Teachers

With the development of higher education, the teaching content has increased rapidly and deepens, and students demand became more and more diversity accordingly. Therefore, the traditional education is unable to satisfy the needs of modern teaching. On the other hand, constructing a teaching team and implementing a team teaching can change the traditional teaching methods effectively and improve the teaching efficiency. Due to cost and employment mechanism, AOUUs are unable to introduce numerous high-level teaching staff and engineers with abundant experience, to improve faculties' academic level and teaching abilities, and balance the student/faculty ratio, and so forth. Most AOUUs

implement an employment strategy as "small number with high capabilities" policy; some of the AOUUs select an employment policy as "full-time staff and part-time staff combined". In this case, teaching team construction can be beneficial to expand the curriculum leader's radiation effects and develop the production, learning, research cooperation of universities-enterprises. In this way, a complementary advantage between team members can be achieved in both theoretical and practical aspects to obtain a joint improvement. Finally, the teaching innovation ability can be enhanced and the teaching comprehensive ability can be upgraded.

C. Students' Study Enthusiasm Improvement

Teaching team construction and team-teaching implementation are the needs to from computer specialties in AOUUs, and promote their growth and development. The students of computer software specialty in AOUUs generally have shortcoming in basic knowledge, and weak in study ability and initiative. However, the study of computer software specialties asks for a strong basic mathematics basic and abstract thinking ability, which requires students to obtain novel specialty knowledge proactively and continuously. Objectively, the teachers need to have cooperation, to encourage and lead them to enhance their study continuously in the form of baton. In this way, students can be guided in their own specialties during the four years continuously, and improve their proactive and enthusiasm in study. On the other hand, under the implementation of UEC-based team teaching in one course, students are able to know the novel information technology and learn how to use them, which can help them close to the solution of practical problem in real world, and also help them learn from different teachers and decrease the "fatigued fatigue", which would be benefit to students' development.

IV. TEACHING TEAM CONSTRUCTION THOUGHTS AND METHODS OF COMPUTER SOFTWARE IN AOUUS

According to the actual teaching staff situation and teaching requirements, the setting level of computer software can be determined. Depending on the size, it can be set as a specialty teaching team, a courses-group teaching team and a course teaching team. Specialty teaching teams take a specific specialty as the basis. Courses-group teaching teams base on more than two relevant subjects, containing multiple core subjects covering whole specialty. Course teaching teams are established on the basis of one specific subject. Teaching teams also can be divided into practical teaching teams, competition coaching teaching teams, based on required special subjects. Based on the actual situation of teaching staffs, the mentioned teaching teams could be set up simultaneously or selectively [8].

All the members of the teaching team should be teaching staff, laboratory instructors and industry engineers. Within the team, the inside leadership and decision-making power are shared. The team's affair is solved and interests are shared in a fair, just, open and transparent way, which can be a foundation to form an effective and well-developed

organization. Each member would undertake a certain teaching workload, and act as a certain team member, who has rights and obligations to play its unique role [8].

In AOUUs, the administrators adopt preferential policies for constructing teaching teams, to encourage leaders to establish teams and teachers to participate in proactively. About the evaluation mechanism, the annual performance evaluation should prefer teams' long-term value rather than individual performance, the management should focus on the objective management rather than process management, the evaluation should underline contract duration than annual review, and the assessment should put more emphasis on quality than numbers [8].

V. A PRACTICE IN ZHEJIANG SHUREN UNIVERSITY

A. An Organization and Management Methods

The teaching team construction thoughts have been applied in Zhejiang Shuren University. A teaching team has been established, the members contain on-campus teaching staff and engineers with close connection and cooperation. Within the team, there are 26 members from our university accounting for 60%, and 17 engineers from cooperative enterprises which accounting for 40%. From the aspect of professional title, there are 6 professors, 17 associate professors or senior engineers. And also 18 members are lecturers, engineers, lab technician, and 2 assistant professors. From the aspect of academic level, there include 4 members with Doctor Degree and 38 members with Master degree.

The team carries out a responsibility system under the leadership of the Team Construction & Management Leadership Group. The teaching team leaders are the core of the team. They should already have obtained a certain academic achievement and academic insight in a certain subject area, and are able to grasp the frontier and future direction of development of subjects. Besides that, they also should have deep love for education, and be capable to hold the characteristics and regular patterns of computer software specialty education in AOUUs. And also the leaders have abundant teaching experience and adept teaching skills. Moreover, the leaders should have a clear understanding of the industries' requirements on talents' knowledge, ability and quality, and also they should realize students' thinking and study status. Furthermore, the leaders also should have high moral character and be charisma, which can attract people, unite people and coagulate people. Last but not least, the leaders must have strong leadership and coordination skills that can reach a close connection with team members, and establish a harmonious environment in the team. The teaching team leaders are not always the person in charge of the faculties, departments, or specialties. It needs a lot of efforts being a team leader, especially in AOUUs which have limited staff resource and heavy teaching workload. Therefore, the universities and faculties should motivate and support appropriate leaders to form teaching teams and guide the other teachers to get close to the leaders, using policies and interest-oriented mechanism and employing allowance and evaluation-oriented measures.
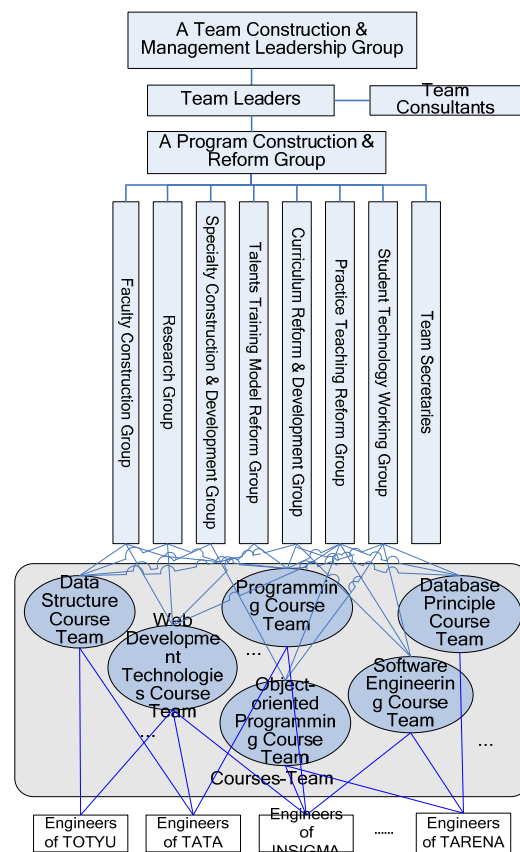

Figure 1.   Structure of UEC-based Teaching Team

Team leaders are responsible for the formulation and implementation of team development plans, funds use schemes and management systems. The person in charge of the team, teaching construction and reform groups, curriculum groups should assist the college to report key program and new specialties. They also need to provide help for the college and the department to promote reforms in talents training models and curriculum systems, and implement the curriculum construction and reform. Besides, they should report to a number of teaching projects, research projects, teaching achievement awards, quality courses and key courses at all levels. Moreover, they should carry out academic communications, teaching experience communications within the college. Furthermore, they are responsible to monitor the construction situations of every teaching project, and finish the related teaching affairs the college asked. The team insists academic freedom, and the excellent members would be elected by all the members according to the corresponding rules through the principle of democratic centralism.

The organizational structure of the teaching team is presented in Figure 1. There exist seven special teams and a teaching secretarial under the Program Construction and Reform Group, as a faculty construction group, a research group, a specialty construction and development group, a talents training model reform group, a curriculum reform and development group, a practice teaching reform group, and a

student technology working group. The teaching team has a person chiefly in charge, and several persons in charge of the Program Construction and Reform Group and curriculum groups. The team also has one team secretary and 2-3 consultants.

TABLE I.   RESPONSIBILITIES OF GROUPS

No.	Groups	Tasks
1	Planning and Construction Group	Team's overall planning and construction
2	Management Mechanism Research Group	Management mechanism research, daily management and assessment
3	Specialty Construction Group	Specialty construction, talents training model reform and curriculum construction
4	UEC Project Group	Cooperation models, practical teaching and reform
5	Research Group	Scientific research, promote research level and expand horizontal projects
6	Students Technology Working Group	Students research programs, technology competition and UEC technology projects

Under the leadership of the Team Construction and Management Leadership Group, the team can be divided into several teams longitudinally, such as a planning and construction group, a management mechanism research group, a specialty construction group and a UEC project group, which can be responsible for the team construction, specialties development, talents training and project cooperation. The team also can be divided into a series main courses transversely, including a programming course team, a software engineering course team, a database course team, an advanced programming development course team, that are responsible for main courses construction and teaching reform. The team also set up some special teaching teams of software outsourcing development with close cooperation between the university and enterprises, such as TOTYU, INSIGMA, TATA, ASIAINFO and TARENA, to implement a target training of outsourcing engineers cooperatively. The team developed *computer software teaching team construction and management measures*, and signed a series of cooperation agreements with the relevant enterprises, forming a reciprocal UEC mechanism. The team is established by the university and enterprises jointly, and responsibilities of groups are shown in Table 1.

B. Achievements of Teaching Team Construction

The team has gained great success in education reform, education research and talents training since team's establishment. The team promoted the computer science and technology specialty to win the award of provincial key major. Moreover, the subject of computer application received the award of provincial key subject and the UEC

software outsourcing practice base co-built by Zhejiang Shuren University and TOTYU Group is listed as provincial extracurricular practice base. The team has received numerous provincial awards, e.g. Zhejiang Province Higher Education Achievement Award, Provincial Excellent Courses and New Century Teaching Reform Program. The team also obtained lots of university-level awards on the following aspects, such as excellent courses, key courses, special courses, teaching research, teaching reform program and teaching achievement, and so forth. Furthermore, the team gained excellent teaching awards both collectively and individually for several times. The student science & technology group guided also has won a number of awards, such as national and provincial awards of ACM Programming Contest. In addition, the group gains almost 30 funding plans, such as Fresh Research Talents Plans and College Students Innovation Schemes. Graduates of computer science and technology specialty have enhanced their practical abilities, and their employments expectations are getting higher. Besides, the team is also awarded as key teaching team in our university.

VI.   CONCLUSION

In AOUUs, the teaching team construction has faced several shortcomings. And it is necessary to construct teaching teams in computer software specialty. Therefore, we proposed some construction ideas, including teaching team setting, team management models, and evaluation mechanisms and incentive systems. Finally, we implemented into Zhejiang Shuren University and construct a UEC-based teaching team of computer software specialty.

REFERENCES

[1] T. Ma, "Objective-orientation and Strategies Analysis of Teaching Teams in Universities", in, China Higher Education, vol. 11, pp.40-42, 2007.

[2] B. Liu, "Higher-level Teaching Team Construction to Improve Teaching Quality of Undergraduate Courses", in China Higher Education, vol. 5, pp.29-31, 2007.

[3] J. Zhang, Y. Xu, and W. Zhang, "Thoughts on Sustainable Development Teaching Team Construction", in Computer Education, vol. 10, pp.58-61, 2010.

[4] P. Xu, "An Interactive Integration of Industry and Academy: A new Approach Towards Reconstructing the System of Faculty with Industrial Experiences in Higher Vocational Education", in Exploring Education Development, vol. 3, pp. 71–73, 2007.

[5] B. Hu, D. Zhou, and L. Zhou, "Systematic Assurance for the Construction of Excellent Teaching Staff Team of Higher Vocational Schools", in Vocational and Technical Education, vol. 11, pp. 62–65, 2011.

[6] S. Hu, "Building the Teaching Team of Computer Communications and Networks", in Computer Education, vol. 6, pp. 134–136, 2010.

[7] S. Tao, Y. Li, and X. Liu, "Virtual Team and ODL Teaching Reform– Analysis of the Operating Mechanism of the Course Team for 'Computer Applications Basics' ", in Open Education Research, vol. 16, no. 4, pp. 65–69, 2010.

[8] C. Chen, S.Ye, B.Zhou, and G.Dai, "Study and Practice on Teaching Team Construction of Computer Specialties in Private Undergraduate Universities and Colleges" , in IEEE 10th International Conference on TrustCom, 16-18 Nov. 2011, pp: 113- 1318.