

Progressive Practice Training Mode Reform for Students Majored in Software Engineering

Zuqiao YANG

Computer School of HuangGang Normal University, HuangGang, 438000, China
jsjyzq@hgnu.edu.cn

Abstract: Students majored in software engineering have poor practical ability and professional quality currently, to meet the needs of industrial restructuring of the information society and the challenges of the diversity of Software talents, student's training quality and innovation ability should be improved. The requirements for the national and regional Software talents training are analyzed firstly; and then the problems existing at present in Software talents training are discussed; and then progressive practice training mode of experimentation Software Talents' is presented. The characteristics of application-oriented Software talents' progressive training mode in regional universities are outlined at last. By integrating computer science and application curriculum, computer school of Huanggang Normal University reformed its students training mode, which effectively enhanced students' professional quality and technical skills, making them competent.

Key words: *Software engineering; Application-oriented Software talents; Progressive training mode; Professional quality; Curriculum*

I. INTRODUCTION

For regional universities, because of short of the time in school building, limited to the scientific research resources, and so on, the emphasis on their talent cultivation objective should be put on training interdisciplinary and practical talents serving for regional economy. Along with the unceasing deep penetration of social informatization, both the society and the industry demands diverse talents. Therefore, a very important aspect of talents training is to cultivate students' comprehensive application capability. From the feedback information of software industry employment, the software professional education of regional universities is facing embarrassments[1][2]: survival and competition. On the one hand, they are bearing the pressure of software professional education competition; on the other hand, the graduates' employment difficulty increases [3][4].

How to improve the competitive advantage of software specialty has become a common problem of regional colleges and universities. Software graduates of regional colleges and universities are usually lack of practical experience, or what they learn from school is apart from the needs of enterprises. This prominent contradiction shows that software talents in the new period should

have comprehensive abilities. They should not only accept theoretical teaching, but also need systematical scientific experimental and practice training [5][6]. To put into practice the innovation of Software talents training in regional universities, first an accurate professional orientation must be made with consideration of regional economic development, and the training mode, curriculum setting, experiments and practice arrangement should be in agreement with the needs of enterprises.

II. THE DIFFICULTY OF SOFTWARE TALENT TRAINING IN REGIONAL UNIVERSITIES

There are the following main reasons that cause the difficulty of software training in regional universities[7]: First, the specialty orientation of Software talents training is not clear. There is no clear distinction in training standard, training level and training type between different schools, lack of its own characteristics. The talents trained are becoming assimilated in their fundamental knowledge, ability level as well as quality requirements. The problem of Software talents training mentioned above is more serious in regional universities, which can hardly meet the requirements of software industry as well as information service industry on Software talents during national and regional economic development. The teaching program, curriculum system, teaching pattern, and even the teaching objective of different schools are almost the same, lack of multi-level Software talents training modes that are fit to different needs of software engineering and software industry. Because the training hierarchical structure is not reasonable, the whole software industry lacks not only high-end talents, but also low-end talents[8].

Second, the speed of Software talents training system adjustment is lagging behind that of software industry development. Compared to traditional industries, software industry has a high speed of knowledge update, which makes Software talents difficult in keeping up with the development of software industry. Generally, in software industry, new technology is first applied in enterprises; therefore, the curriculum system set and the knowledge taught cannot meet the need of enterprises[9]. This is the reason there is difference between what Software talents have learned from universities and what the society requires.

Finally, the teaching in regional universities also exist some problems: some of teaching content is out of

date; teaching tools and methods are lagged; the teaching staff is not in accordance with the requirements of application-oriented Software talents training; seldom project training and business training is provided to students[10]. All of these problems make graduates difficult in dealing with project organization, industrial process, module interface and gradient testing during software development.

Software is a kind of high-tech product. During the early stage of its development, outstanding elites like experts are needed because of technological requirements. At the same time, software must be put into use, thus low-end personnel is also in demand [5]. The above feature of software development raises new requirements on talents training. Software industry has its specific characteristics such as high-technology, rapid development, high knowledge intensive, good foreign language usage requirement, high knowledge update, and strong problem solving ability. Most regional universities do not take these features into consideration when they make and carry out their training plan, and therefore the talents so trained can hardly satisfy the requirements of enterprises who need software development-oriented, service-oriented, engineering application-oriented and secondary development-oriented talents. Those prosperous Software talents training centers do a very good job in training talents. They take full consideration on both the characteristics of software development and the requirements of enterprises. On the one hand, the society demands a lot of Software talents; on the other hand, software major graduates from universities can hardly accommodate to enterprises' requirements, thus they often need to be trained in those successful training centers for a period of time before they are employed.

Therefore, how to make a reform of the experimental and practice teaching so that students trained can accommodate to the quick information technology evolution is the prominent problem to be solved in present software professional education of regional universities. This paper discusses about the Software talents training mode of regional universities based on the training pattern taken in computer science school of Huanggang normal university.

III. PROGRESSIVE PRACTICE TRAINING MODE

The reform of software specialty training mode is always a long-term issue of concern and research of educators engaged in undergraduate teaching. Many scholars at home and abroad are engaged in theoretical research of talents training modes, and they have made great achievements, which play a guiding role for further exploration of talents training modes. For example, American educator, John Dewey, raised the idea of "Learning by doing" that greatly broadens the patterns of talents training. "National long-term education reform and development plan outline" specifically requires that schools should update talents training idea and innovative talents training mode, and cultivate talents of all types and at all levels to adapt to the requirements of

modern society. Particularly, the cultivation of application-oriented innovative talents is the primary task that should be accomplished by universities. For software specialty in regional universities, how to make reform on talents training mode so as to cultivate talents adapt to regional economic development is the top issue needed to be resolved soon.

At present, there are the following experimental and practice teaching mode in regional universities: experimental teaching in laboratories, enterprise training, graduation practice and some other social practice activities. The practice teaching system seems to be systematic and scientific, but it has some drawbacks because some experiments are only for validation, and they are fragments, not integral, and even are given randomly, mainly for the sake of deepening students' understanding of their theoretical knowledge. The true practice procedure should be a type of "actual combat", which should be systematic, continuous, and deep going. Therefore, Huanggang normal university raised an idea of progressive training mode of experimental and practice teaching, persisting in the strategy of combining theory with practice, in class learning without training, school cultivation with enterprise practice, and built up a learning path for students from theoretical fundamental to ability training to comprehensive application to application innovation. We also set up a training mode formed by four key links: fundamental practice teaching, professional practice teaching, society activity practice teaching, and enterprise practice teaching.

To satisfy different requirements of society on talents with different level and type, and put an emphasis on students' personality development and subjectivity development, our school divides students of software major into three types based on three training directions: software theory research, software design, and software application and information security. Based on the original teaching mode, we not only emphasize students' fundamentals, but also cultivate them according to their directions period by period, with each period connected to each other and deepened on.

IV. MEASURES OF CARRYING OUT PROGRESSIVE TALENTS TRAINING MODE

A. Optimize the talent training scheme

Highlighting professional application ability training is the main difference between application-oriented talents and research-oriented talents training. The key lies in how to carry out daily teaching and practice, and setting up reasonable and scientific curriculum system of theoretical teaching as well as experimental and practice teaching. The curriculum system must satisfy market requirements of software industry development. It should emphasize not only theoretical knowledge teaching but also practice teaching. Theory, technology and application must be combined together to set up the curriculum system, with professional application ability as its backbone. The idea of modularity can be adopted, which means examining teaching effects stage by stage.

B. Adoption of case teaching methodology

To improve students' problem solving ability, the case teaching mode should be taken so that theory can be closely combined with practice. Through practical cases of IT enterprises, students can access to practical engineering projects or application projects at an earlier stage, which not only improves students' learning interest and problem solving ability, but also enriches their practice experiences. They can easily apply their theoretical knowledge into the practical projects, hence deepening their understanding of what they have learned from schools.

C. Teaching staff training

Application-oriented software professional teachers should have sound IT background, project development experience, acute industry development prediction ability and scientific research ability. Teachers should enter into IT enterprises for practice training so as to improve their own software development ability, and get known the trend of industry development as well as the characteristics of talents in demand. Schools can hire technicians with rich software development experience from enterprises as part-time faculty. Only if schools and IT enterprises have cooperation, teachers can be given full play to the role of instruction, and students can be provided with correct guidance.

D. Improving management system of software innovation practice

To improve the practice and engineering ability of application-oriented Software talents, experimental teaching should be emphasized. Comprehensive experiment should be carried out for each professional subject, and project training should be provided as important courses. When arranging the experimental subjects or projects, course knowledge should be considered and applied so that students can obtain a comprehensive and deep understanding of what they have learned and can improve their problem-solving ability. For comprehensive project, students are required to apply knowledge of several courses and accomplish a more complicated task. To complete the task, students should begin with requirement analysis, and then proceed to general design, detailed design, coding, and testing. As a result, students can get familiar with large-scale software development at an earlier stage, experience software development process, and accumulate development experiences. At the same time, more attention should be put on enterprise project training and graduation practice. Students are required to carry out their graduation practice with consideration of their undergraduate thesis. When they are doing their thesis, they are required to do something related to practical projects so that they can have clear learning objectives and active learning interests. Besides, students can obtain true feelings of being different roles in performing different tasks of a large-scale project, which can promote the transform from professional

knowledge to professional skills, as well as the transform from students to enterprises staff.

E. Joint training provided by schools and enterprises

Joint training provided by schools and enterprises can cultivate true engineering application-oriented talents, solving the problem that students can hardly meet the requirements of enterprises and accommodate to enterprises' ways of doing things, as a result, graduates can obtain jobs more easily. There are the following measures to realize the seamless connection between talents trained by schools and talents employed by enterprises. (1) Joint training by schools and enterprises, let enterprises take part in curriculum design, practice training arrangement, and graduation project. (2) Set up a feedback and update mechanism of talents training. Widely collect talents requirement information through enterprise visit, discussion between schools and enterprises, and requirement consultation sheets, and then make adjustment on talents training plan based on requirements of enterprises and industries, as well as technology development.

From discussed above, the progressive practice training mode is shown as Fig .1

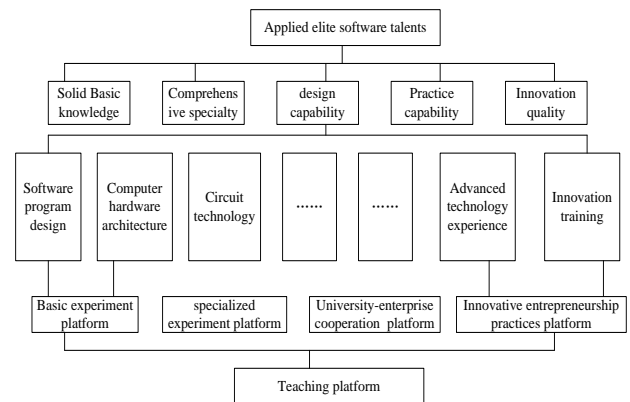


Figure 1. Practical training system

V. CONCLUSION

Our training plan and training objectives is in accordance with the requirements of software enterprises. When selecting teaching materials, the newest software technology and relative knowledge should be considered according to the update status and features of software technology. During teaching, case-driven teaching mode is adopted, and projects imitating practical software development should be provided to students. Teachers also take part in practical projects so as to cultivate teaching staff experienced at software development. The ration between experimental teaching and theory teaching assigns reasonable.

Our school began recruiting students of software specialty since 2011; the TABLE I is surveyed from students for nearly three years. We have carried out beneficial attempt and discussion in teaching reform, and obtained some achievement and experience in training application-oriented software talents.

TABLE I Student employment latest three years

The academic year	Public institution	Enterprise	Special department	Further study	Total
2011	40	37	3	41	121
2012	34	55	2	38	129
2013	45	63	5	42	155

REFERENCES

- [1] Mike H.. The Information Technology Mode Curriculum [J] .Journal of Information Technology Education, 2006 (5):338-342
- [2] Xiao hui C., Hong wei L.. College Computer-related Major "3+1" Personnel Training Mode[J] Electronic Science and Technology[J], 2010,23 (06) :112-113(in Chinese)
- [3] Dai-zhong L., Wan-cheng L., Rui L.. Training Mode Reform of Students Majored in Software Engineering in Application-oriented Colleges and Universities[J] Computer Education 2010 (4):4-6(in Chinese)
- [4] Yan-ru S.. Research on Training Mode for Application-Oriented Person of Software Engineering[J] Computer Knowledge and Technology, 2012,5(36):10521-10522(in Chinese)
- [5] Xudong C., Weijun C., Yudong L.. A Teaching Mode of Application-oriented Undergraduate Major in Computer in Regional Universities[J], Computer Education,2010(5): 52-54(in Chinese)
- [6] XIONG Wei, HONG Mei.Exploration and Practice of Construction on Software Engineering[J].Research and Exploration in Laboratory.2010,29:59-61(in Chinese)
- [7] XU Hong-zhi,QIN Zun-yue.Construction of a Practical Teaching System for SoftwareEngineering by School-enterprise Cooperation[J].Research and Exploration in Laboratory. 2013,32:128-130(in Chinese)
- [8] Jia Jingdong,Lin Guangyan,Tan Huobin.Market-oriented Teaching R eform for Software EngineeringPractice: A Case Study on the College of Software at BUAA[J].Journal of Beijing University of Aeronautics and Astronautics(Social Sciences Edition).2014,2:107-112(in Chinese)
- [9] GENG Kui-hua,QIN Hai-ying,LU Cui-ying,etc..Strengthening Experimental Practice to Train MechanicalEngineering Students''Four Abilities'' [J].Research and exploration in laboratory.2011,7:96-99(in Chinese)
- [10] LUO Jin-kun.Existing Problemsand Counter measures for Teaching Software Design Pattern[J].Journal of Guangxi normal university for nationalities.2014.3:55-57(in Chinese)