

PBL Research in Software Engineering Teaching

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Abstract. PBL (Project-Based Learning) in Software engineering teaching comes from Problem-Based Learning. The later has become an increasingly popular method of instruction among educators recently. Along with the development of the computer software technology, and urgent need of nation to the software workers talented person's quantity and quality, the cultivation of the software worker and manager becomes more and more crucial. Combining the teaching experience of many years to the software, this paper studies the PBL design and operation in software engineering education, provides a way of thinking for the reform of Computer Vocational-education.

Keywords: Project-Based Learning, Teamwork, Software engineering teaching, Vocational training

1. Introduction

Problem-based learning (PBL), first proposed by neurology professor of the Canadian -- Barrows in 60's of last century. First, medical schools have been promoted and constantly revised. By 1990 almost 40% of the medical schools adopt PBL (Hendry & Murphy, 1995). By 2000, the Engineering Institute in the United States about 50% of the curriculum adopt PBL (Abman & Lopez, 2000). In other countries, many institutions adopt this method of teaching or teaching reforms, including Education, Business, Engineering, etc. and a number of high school. PBL has become internationally popular teaching method [1]. In China many training institutions, vocational schools, colleges and universities (Wuhan University, Anhui Medical University, Fourth Military Medical University) also have a lot of useful attempt.

Problem-based learning is cognitive psychology and information processing psychology based. It stressed that the study set to complex, meaningful questions (items) scenario. The authenticity of learners work together to solve the problem (project), to learn the science behind the problem implicit in the knowledge, develop problem-solving skills, and strengthen the ability self-directed learning. It belongs to the scope of constructivist learning theory [2].

This method and the traditional subject-based teaching methods vary widely:

- It will change in teaching methods to students-led from the teacher-led. It emphasizes the student's initiative study-based, rather than the traditional teaching of the teacher taught.
- Theory Pilot into Practice Pilot. These questions (items) is very close to the real world or the real scenario, the students have a certain challenge, can not simply apply the old of the solutions not simply apply the theoretical knowledge, the learner can fully develop, analyze problems, problem-solving

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abilities To ensure that future students the ability to work and study effectively migrate to the solution of practical problems.

- Student self-inquiry based, supplemented by the guidance of teachers, students analyze and solve problems in the process of learning. The responsibility of teachers in PBL is to provide learning materials, and guide students to learn, monitor the learning process so that a smooth manner.
- Stimulate and support the students a high level of thinking that students should be the integration of wide range of subjects or themes, emphasizing the role of social exchange and cooperation, emphasizing the support and guidance and so on.

According to Biggs's theory, teacher-led instruction into a student-led change is precisely the "theory to explain" to the "problem oriented" changes. "Problem-based learning" greatly enhanced the nature of learner participation. Different teaching methods will have a great influence to the growth of professional knowledge and non-professional knowledge. As shown below (Figure 1), PBL applications, the high participation of students have knowledge of most value, the value of their knowledge, including knowledge and memory, knowledge, understanding, knowledge application, knowledge by analogy, knowledge creation and theory building. "Problem solving" and "Problem-oriented" have in common, both to analyze and solve problems, but the "problem solving" more real time, you can use readily available information to solve, do not spend the time to do research [2].

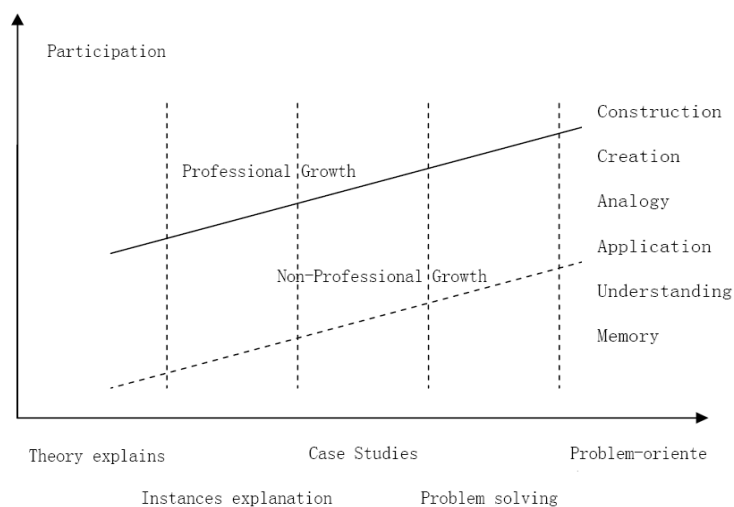


Figure 1. Participatory teaching methods and the impact on knowledge development

2. The Basic Steps Of PBL

In fact, PBL's operating procedure is not a static model, the different fields of knowledge, different courses, the use of PBL will have different characteristics, should be based on subject characteristics and Students with flexibility, the key is to solve the problem by raising and construction of knowledge and experience to achieve . Teaching in computer software, our problem is that a project in the computer software instruction in PBL is the Project Based Learning. According to the model of Barrows, PBL generally include the following components:

- Team formed: Before solving project, students must first form a study group. A class can be divided into several teams according to the number of projects required.
- Propose new project: Provide students with a comparatively complex project. The project should try its best its case in the real world is close and be able to attract students. When solving project, the students and teachers to address the objectives of the project a common understanding.
- PBL procedure: Team members what they have learned to communicate, collaborate. In solving project process, they learn something new to generate new ways to solve the project.
- Activity report: The team used a variety of different forms to report the results of their own conclusions, and for the conclusion of the procedure results, such as software architecture, algorithm analysis, software products, and oral reports. PBL stressed the project is not just for students to solve problems, and let them understand the project framework and the relationships and mechanisms behind the problem.

Reflection on project: In order to extract what they have learned, students will deliberately reflect on project (problem) solving process. To consider different solutions of the project (problem), which can help them to summarize and understand new knowledge.

3. Vocational Training Status Of Computer Software

From China's current status of the computer software professionals' education, it can be found that, software professionals of the structure and level of training is gradually emerging out of bias and imbalance. Either from the contents of training mode or from the training point of view that the software industry can not meet the current demand for talent. According to the Software Association report, there are only 6% of students from vocational and technical schools. Then, as the train, computer software application of talent in college has the responsibility to nurture a large number of "software blue collar" to meet the current "software professionals" a huge gap in demand.

However, China's vocational schools imitate universities training mode, there are obvious shortcomings:

- Education can not keep up with the needs of business units, too many basic education is often stifled human development.
- Teaching materials behind the leading edge of computer technology, software engineering course from the actual teaching, curriculum design is not professional into the guide, but in professional development and research-oriented academic.
- Curricula are basically the same to Tsinghua University, Beijing University and other universities', and lack the characteristic, echelon and practicality;
- Too much emphasis on learning and mastery of knowledge have been ignored in practice, did not reach the dissemination of knowledge, skills, training and extensive application purposes.

This result is that these software designers only know theory. However, the practice is not strong.

Vocational education is to train the students with high professional ethics, a solid basic knowledge, practical ability and a strong basic skills proficiency, can stand abreast of the latest cutting edge technology, familiar with the software specifications of the production line working software professionals.

4. Advantages Of PBL Using In Computer Software Teaching

Imperative to reform the teaching of computer software and computer software development with the practical, feasible for the development of PBL in this area provides a new idea. In addition, software companies tend to use the team development model development, this organizational model is precisely consistent with PBL.

Software development has a very great operational, and learning from passive spoon-fed, into the team collaborative learning, teachers from the "Teacher" into the "Instructor", give guidance and direction to students. Meanwhile, the use of real projects cited cases, to strengthen the students hands-on practice session, students develop the soft capacity, jobs for students pave the way set foot in order to achieve a real sense of "Teaching" to "Training" of the transition

5. PBL Design

PBL teaching computer software design patterns can be characterized according to the school situation and student flexibility, the project team assigned to the same class alone, but also across classes, even for multi-disciplinary. Model with Barrows, PBL can be designed from the following aspects:

5.1. Design Of The Project Scenario:

The course content integration into "one or more large projects" into (the project can make the teachers assumed; it can be outside the school project, etc.). Teach contents implied in the project. According to their own professional course requirements and their own interests under the guidance of the teacher, Students choose their own module. They focus so that students learn to use their own what they learn, their self-knowledge, analyze and solve problems, but at the same time penetration of the project management and process knowledge. These projects are derived from the needs of the community can help solve many social enterprises concerned practical problems.

5.2. PBL Process Design:

Under the guidance of the teacher, students learn knowledge, access to relevant information, the group unity and communication and collaboration, to complete the project. In the process of creating a learning organization, knowledge sharing and learning is a key part of the team, the students in the sharing of learning and growing. In general, software companies have a relatively strict division of responsibilities (such as: planners, designers, operations / support engineers, programmers, project managers, requirements analysts,

etc.), but the software can not have such strict teaching should enable students to fully Play multiple roles, to achieve training objectives.

5.3. Self-Study Environment Created

The solution depends on many projects self-learning activities of students. In hardware, we can use the campus network or Internet collaboration, office software and documentation to facilitate ease of delivery greatly improves the efficiency of collaboration, the other, you can open up a campus network dedicated to discuss the exchange part, easy to group the team of discussions between the team and the instructor and group discussions, in the computer environment, the students into the information in order to avoid confusion, we create for them a good self-learning environment, in a small area display learning content, and the application step by step entry way to guide students; followed students in learning to give guidance to help learners to manage their daily learning schedule; Third, we can take a variety of strategies to stimulate students to think or through various types of questions and inspections list to provide opportunities for learners to self-testing.

5.4. Evaluation of PBL

The evaluation methods of PBL's software teaching are varied. As the project solution, for some basic knowledge, students can Midterm and final tests to detect, identify their own learning goals and knowledge to master the gap between the real results of the project (software works and paper) as an important basis for test results. In addition, the results of research projects, students in various forms on the campus network or the Internet. On the one hand you can draw on collective wisdom, to see lack of inspiration; the other hand, the mutual exchange and comparison will help to promote and stimulate students motivated. Finally, a number of ways teachers can all the students with individual or group learning to do something in project evaluation, in order to encourage students to study different ways to explore different points of view.

6. Conclusion

The prospect of China's vocational computer education is to a large extent influence the prospects for China's computer industry. The prospect of China's vocational computer education is to a large extent influence the prospects for China's computer industry.

Vocational education and training computer personnel should be competitive with the community and even the international competitiveness of the application of talent. In particular, the development of China's software industry urgently needs a large number of such high qualities, strong skill set. How to vocational education reform, how to shorten the distance between schools and enterprises, is to comply with the characteristics of the current development of the industry. PBL teaching gives us this revelation: people trained to be the first time for the enterprise, and soon added to the large-scale software design projects, with a unified, standardized language, code programming. This standardization of the development of China's software enterprises, improve the overall quality level of China's software industry is very important.

7. Reference

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