

A Preliminary Analysis of Engineering Bidding Practical Training Software Applied to Problem-based Teaching Methods

Yuan Wang

College of architecture and civil engineering of Chengdu University, Chengdu, 610106, China

Abstract: Under the traditional teacher-centered teaching method, the knowledge of the bidding course mastered by the students mostly belongs to inert knowledge, which with poor transfer elasticity, low migration level and other problems. As a result, school teaching does not match well with practical work. Problem-based teaching, on the other hand, is student-centered, with students exploring and learning in situations close to real work, which will reduce the generation of inert knowledge, improve the elasticity of knowledge transfer, and contribute to the smooth interface between school teaching and real work. In this teaching process, the series of bidding software for practical education developed by Glodon Co. may play an important role. It is explored that relevant role of the software series in enhancing teaching context and providing scaffolding in the context of problem-based teaching in bidding courses in the paper.

Keywords: Bidding Course; Problem-based Learning (PBL); Glodon Series of Bidding Training Software.

1. Bidding Course Development and Learning Status

Bidding is an important way to establish the contracting relationship between the two parties of engineering contracting in China, playing an important role in the field of current engineering construction, and its development is becoming more and more mature. Therefore, the course of "Engineering Bidding and Contract Management" is the main course for engineering management majors, and also an extended course for other engineering majors. Its purpose is to enable students to master China's engineering bidding procedures and the bidding documents and bidding documents writing, to familiar with China's bidding laws and regulations knowledge and the content of the contract, to understand the initial establishment of the engineering contract process, and to help students establish the whole process of engineering management concept.

The content of this course is mainly declarative and procedural knowledge as far as the content of the bidding section is concerned. It mainly includes the procedural flow sequence and procedural implementation requirements in the relevant legal provisions, as well as the standard format and content preparation of the relevant bidding documents. The main teaching method currently is teacher who the center of the class explains the knowledge points, and the students passively accept the knowledge. This way of teaching makes students feel boring and dull on the course, and the learning efficiency is low.

Under conventional teaching, the assessment of students' knowledge mastery is also mainly based on paper-based examinations. The types of examination questions include both objective questions and subjective questions. Objective questions can be set as choice, judgment, fill in the blanks and other types, mainly to examine the basic concepts, relevant legal provisions etc. Subjective questions are mainly based on case study, requiring students to analyze and identify the bidding behavior and content of the description given in the case, point out the errors and give the reasons and solutions.

The essence is still to examine the students' memorized content.

From the point of view of the current teaching effect, there are indeed major shortcomings, for example, in the author's nearly three bidding and contract management course teaching evaluation, the midterm examination adopts the traditional paper composition assessment, that is, by the choice, judgment and case analysis of the composition of a full-point questionnaire, and final assessment adopts production and analysis of bidding documents of the form. Comparison of the three midterm examinations and final document productions show that, although in the objective questions, most students can notice the specific provisions or a specific procedure and make the correct choice or judgment, and even a lot of case study questions, students can also make the correct analysis and description. But in practice, such as the production of bidding documents, the number of students who can ensure that the content of the documents to meet the needs of the relevant legal requirements will be greatly reduced. The knowledge acquired by students through memorization is difficult to apply in practice. That is, the relevant knowledge acquired is mainly inert knowledge, and knowledge migration level is not satisfied with goal of the teaching.

It is necessary to break through the current teaching dilemma. What needs to be focused on and solved of this course currently is that how to eliminate the differences and mismatches between the school teaching and the actual work, ensuring that the knowledge related to bidding and tendering learned by students in school environment can be effectively applied to the social work environment. One of the current solutions is practical training, that is, through the simulation of the actual engineering bidding process, students recognize the actual bidding work and design relevant bidding documents in this context. Under the guidance of this idea, the engineering software developers are also competing to develop a variety of bidding software to simulate actual bidding process for educating use.

2. Software Introduction and Application Analysis

At present, there are a large number of practical training software on the market about bidding, but there are quite a number of practical training software, which still takes the production of bill of quantities as the main practical training content of the bidding course. Although the bill of quantities is an important part of the bidding documents, it is not the main content of the bidding course, and the course still emphasizes the implementation of the procedures and related regulations, and the bill of quantities is only one of the parts, not even the most important part.

There are also some bidding practical training software developers noticed this problem, so they developed software modules for practical training linked tightly with the main content of the course, which includes bidding documents training and tendering production training software, even the bidding score system. In order to simulate more realistic working environment, students need to take into account project register, the credit review of the bidding unit, as well as the using online bidding like the actual work. At present, the universities and colleges that carry out practical training for this course have widely used Glodon series of bidding and tendering training software which developed by Glodon Co. It includes bidding sandbox, bidding document preparation tool online, tendering document preparation tool online, bidding evaluation system and other modules. The system covers the whole process of bidding work and document compile system. Subsequent discussion will take the software as an example to start.

At present, the bidding software is mainly based on practical training, and in the curriculum arrangement of colleges and universities, it is usually a centralized practical training after students have the class, and it is also arranged only about one week. [1] During the practical training, students use the bidding software, combined with the knowledge learned in the previous class led by the teacher, to simulate the bidding work in the actual work. The practical training process is actually a projection of the memorized knowledge on the software, and the students do not effectively study because that self-exploration executed by students is still very limited. Low level of knowledge migration does not be changed as that the teaching method is still the traditional mode, and it does not substantially break through the teaching dilemma that currently exists in the course.

3. Problem-based Learning (PBL)

Modern educational science views scientific knowledge as situational, practical, and produced through collaboration. Only through such learning can students truly internalize what they have learned, and use the knowledge in the practical work with breaking the mismatch structure between schooling and practical work.

Problem-based learning (PBL), which belongs to a way of constructivist contextualized teaching, is developed under the guiding ideology above. Unlike the traditional mode which is teacher-centered, Problem-based learning is student-centered. In this approach, a problem-based learning group is first established, then a problem is designed for a real-world situation, and the integration of knowledge as well as the internalization of knowledge is brined out in a social negotiation group. This is an active way of learning, and

research has shown that in problem-based learning groups, students activate prior knowledge during initial discussions and refine their mental models by discussing the problem with their peers and identifying gaps in their knowledge. While the interest in the real-world situation and the applicability of the problem triggers students' continued participation and stimulates the desire to find new information. The students' desire to find new information relevant to the problem will continue until it is satisfied. In this series of activities, students' behavior changes their minds and knowledge is constructed.

The questions posed in problem-based learning contain four main categories, the types and related concepts are shown in Table 1

Table 1. Types of problems and definitions

Serial No. [ⓐ]	1 [ⓐ]	2 [ⓐ]	3 [ⓐ]	4 [ⓐ]
Type [ⓐ]	Diagnostic issues [ⓐ]	Design-based issues [ⓐ]	Strategic Performance-Based Issues [ⓐ]	Decision-making issues [ⓐ]
definition [ⓐ]	Students are required to determine the cause of the problem [ⓐ]	Students are required to create a work, which usually has a set of functional characteristics [ⓐ]	Students are required to maintain contextual awareness and apply strategies to achieve real-time complex performance [ⓐ]	Students are required to choose or decide among many competing alternatives [ⓐ]

As students explore and solve problems in problem-based learning, they need scaffolding to help them succeed in the construction of knowledge. Scaffolding in this context refers to external support and assistance such as verbal or written prompts from the teacher; software support, etc., which can help learners accomplish more complex tasks that they cannot do on their own, as well as help them learn from these experiences. The idea of scaffolding for learning draws on Vygotsky's idea of development, which suggests that learning occurs in the zone of nearest development, which is tasks that the learner is currently unable to complete on his or her own, but can do with the right help. [2]

A key feature of problem-based learning is self-directed learning, which begins with the identification of learning points and discussion of learning issues. Students begin by discussing their prior knowledge in small learning groups to identify the learning points of learning task and gaps in their knowledge, so that they can plan research to address the learning points, critically evaluated the sources of information they have identified, and engage in self-assessment. The teacher's task shifts more towards helping students recognize and monitor their own learning strategies, and metacognitive which reflect on their own learning and transformation.

4. Analysis of the Use of Glodon Series Bidding Software in the PBL

The bidding course is highly practical, but under the traditional teaching method, the knowledge acquired by students is inert and fragmented, and often cannot be effectively used in real work situations. The problem-based learning approach can help students change this situation, turn course knowledge into a tool for thinking and action, and

improve students' ability to apply knowledge and gain a coherent understanding.

When carrying out the bidding course based on the problem-based learning approach, firstly, a design-type problem is put forward which has been considered by the teacher team, such as designing the text that conveys the needs and requirements of the project owner or designing the text that conveys the willingness of the tenders. Then students will be divided into three roles of bidder, tender, and bid evaluation expert according to their own choices, forming different learning groups and constructing learning situations. The bidding training software of Glodon combines the actual requirements and development of China's bidding work, provides working platform with the actual working environment. It further strengthens the learning context of the course. And highly reinforcing contexts lead learners to future applications of what they have learned and increase their motivation to learn. It also helps students understand the epistemology of the discipline-the way knowledge in a field is organized and produced.

Since the roles in this course involve different professionals, a problem that may also arise from the high degree of contextualization is that the conduct of the course leads to students constructing their knowledge in only one perspective, resulting in the inability to transfer knowledge well in the future. For example, a body of knowledge constructed only in the role of a bidder still has knowledge deficiencies when working in the role of a tenderer, as research has shown that when a subject is taught in a single rather than a composite context, inter-contextual migration is quite difficult. [3] In order to solve this problem, the software can be used to execute two different projects at the same time. Students engaged in a role in project A, and act as another different role in project B at the same time, so that each student could simultaneously recognize of the whole process from two aspects. The students will not only avoid the waiting period in the learning process, but also improve the comprehensiveness of their learning. When students switch between roles, they can fully understand the focus of the work between different roles, which improves their understanding of the overall knowledge, and helps the knowledge migration to different contexts in their future work.

More importantly, bidding practical training software can play a scaffolding role when it comes to problem-based learning. For example, the bidding sandbox simulation in the bidding training software helps students to use their prior knowledge to engage in a full and directed discussion so that they can externalize the differences between their prior knowledge and what they are about to learn. This process helps students to interpret and reflect and develop learning strategies accordingly, and it also helps the instructor to identify if the students' learning strategy choices need to be revised.

The modular design of the software based on expert thinking can help students to simplify the task elements and reduce the difficulty of completing the task, which will help students to reduce frustration and the risk of task failure so that they can maintain their interest in learning. For example, students have no need to consider the complete framework format and sequence when preparing the text with the help of the software, only need to focus learning on the refinement of

the core points of each component, such as the setup of the bid bond, they do not need to consider where this part should be arranged, because this will increase the difficulty of task completion, but mainly need to confirm the reasonableness of the amount and the appropriateness of the submission method. The practical training software also helps focus learners' attention on parts of the problem that they tend to take for granted. For example, the software labels the model for key points with the legal and regulatory requirements and sources, which helps students to identify key information instead of making taken-for-granted decisions.

In short, the combination of the above advantages makes it that learners will learn effectively in task situations similar with experts accomplish their work, and more likely that they will be able to make connections between what they are learning and real-world situations.

5. Conclusion and Recommendations

The introduction of training software into problem-based learning instruction will play a greater role than that in short-term training, and it can substantially change the current teaching dilemma of this course.

Different from a week time for general practical training, it should set an appropriate time, more than 20 days, for execution of bidding process based on bidding related laws and regulations in the problem-based learning, which will make the students in a more realistic time environment for knowledge construction. Adequate time not only meets the actual requirements of the actual bidding work, but also provides students with sufficient time for exploration.

The implementation of PBL requires strong external support, such as the permission, which offer the bidding course in this instructional mode and sufficient duration for completing whole study process of the bidding, is available from the university. And additional faculty members are also needed for this process to ensure that all learning groups have access to faculty metacognitive instruction and that adequate computers and appropriate software resources are available for students.

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