

Teaching Reform of Engineering Economics course based on Postgraduate Education

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Abstract

The teaching ideas and teaching contents of postgraduate students in Engineering Economics should be essentially different and related to undergraduates. The teaching of undergraduate students can focus on the financial mathematics in engineering economy, pay more attention to the setting of various economic evaluation indicators and the mastery of calculation methods, while the teaching of postgraduate students should pay more attention to the analysis, comparison and decision-making process of engineering economy. In order to improve the depth and height of engineering economics teaching for postgraduate students and cultivate the goal of outstanding talents in the field of economic decision-making, it is necessary to explore the teaching content of engineering economics deeply, put forward the arrangement and setting of engineering economics teaching content based on postgraduate education, and actively integrate the latest scientific research results in the teaching process.

Keywords

Engineering Economics, postgraduate education, curriculum content, teaching method, teaching design.

1. Introduction

The Engineering Economics in the postgraduate stage is the basic compulsory course for engineering students and is the core course of the project economic platform. The course integrates technology, economy and management science, has broad theory, wide comprehensive, strong timeliness and policy. It studies the economic analysis of the investment project, focuses on the economy of the project rather than on other basic knowledge such as engineering technology or project management. Its purpose is to solve the problem of despising economic effect in economic construction. Therefore, it is different from the undergraduate stage that the engineering economics of the postgraduate stage is an economic decision-making subject, which is based on the research cost-benefit analysis theory and method, and takes the technical scheme selection and the economic evaluation of the construction project as the main content.

2. Thoughts on the content setting of Engineering Economics course

When setting up the teaching content, considering the characteristics of engineering economics, such as comprehensiveness, systematicness, predictability, practicality, quantitative and qualitative combination, this paper starts from the aspects of economic analysis and evaluation of engineering technology scheme, selection of technologically advanced and economically reasonable scheme, including the following contents:

(1) Identification and definition of engineering economic problems. For engineering practice courses, the best beginning is to identify knowledge points through case problems, define related concepts, and then find solutions to the problems. For example, when explaining the relevant formulas of the time value of funds, we first put forward practical cases, and then carry on correlation derivation through analysis. This beginning is mainly to make students learn to identify problems and form definitions.

Develop a number of feasible scheme. After defining the economic analysis problems, it is necessary to form a number of feasible scheme to solve the economic problems, and the emergence of these schemes is the basis for the next step of economic evaluation and scheme selection. In postgraduate teaching, students can be allowed to use the way of group discussion, through brainstorming method, group decision-making method, Delphi method and so on, to obtain as many scientific and reasonable schemes as possible.

(2) The cash flow of each feasible scheme is formed. After forming the feasible scheme, the teaching content of engineering economics should be arranged as follows: the introduction of general cost and cash flow estimation techniques and methods. For investment estimation, the traditional index method, unit price method and element method are mainly taught. At the same time, the application of prediction method should also be reflected here. The prediction methods that need to be taught include exponential smoothing method, trend prediction method, regression and input-output model prediction method and so on. In addition, the estimation of project cost and cash flow involves the composition of benefits and expenses, so depreciation, enterprise income tax and other related preparatory knowledge should be arranged before this content.

(3) Carry on the economic evaluation to the feasible investment plan. Economic evaluation is the core content and main purpose of engineering economics. Therefore, in teaching, the relevant contents should be arranged in detail, which mainly includes many indexes and methods used in economic evaluation, such as net present value, net annual value, final value, annuity, internal rate of return, investment payback period, cost return rate and external rate of return.

(4) The selection and implementation of the optimal scheme. The comparison and selection of optimal schemes is the main content of engineering economics, and it is also common in practice. The methods used include: total analysis method and incremental analysis method. The specific application will also include the following knowledge points: ① Basic methods and tools in operational research. It is mainly used under the condition of fund limit. When there are multiple schemes to be selected, there will be the possibility of a combination of multiple schemes. For each possible comparison and selection, it is a huge amount of work. ② Arrangement method, utility theory and analytic hierarchy process (AHP). It is mainly applied to the quality factors in the process of capital investment decision-making. These factors can not be quantified when they affect the cost and income, so they need to be quantitatively processed and calculated. ③ The method of risk analysis. It is mainly used to solve the problem of risk and uncertainty, such as break-even analysis, sensitivity analysis, probability analysis, simulation and decision tree, which are all important components of teaching.

(5) Post-project evaluation. This is the last content of engineering economics, and it is also the key procedure in the whole decision-making process, but it is also the most easily omitted part of most engineering economics teaching materials and teaching. The content of post-evaluation is important because it is not only the evaluation of the completed project, whether the decision-making is correct or not, but also can provide useful reference information for future decision-making. So it should be set as the link of the training student's relevant economic analysis ability.

3. Design of Teaching method of Engineering Economics

Engineering Economics involves a lot of knowledge, but it is more abstract. For students of science and engineering, the calculation formula and analysis program have a certain difficulty. Therefore, it is a good way to help them to deepen the basic knowledge, basic content and basic skills.

(1) Autonomous classroom teaching method. In postgraduate teaching, it is advocated to encourage students to participate actively and to reduce teacher-led teaching methods at the same time. In the classroom, teachers can gradually ask questions from shallow to deep, students can identify and define the problems according to what they have learned, and think about the preliminary solutions. In order to cultivate students' ability to learn independently and draw correct conclusions. At the same time, when we encounter something difficult to understand, we can use the way of classroom

discussion, through the mutual communication between students, the mutual discussion between teachers and students to open up ideas.

(2) Case teaching method. Case teaching is very important in the teaching process of engineering economics. In the process of learning, cases are constantly introduced, or the boring chapters are introduced with cases at the beginning of the lecture. Through the case, the students are asked questions, which arouses the students' curious desire for knowledge, so as to stimulate their interest in learning, urge them to study carefully and explore the answers to the questions. For the chapter of practical knowledge, we can also select comprehensive cases to review and summarize the relevant contents, guide students to integrate book knowledge, cultivate students' comprehensive ability to analyze and solve problems, and improve students' interest in learning at the same time.

(3) The making of multimedia courseware. With the development of science and technology, multimedia teaching has been widely used in classroom teaching. This kind of teaching method has a large amount of information and novel form, which plays a positive role in promoting the teaching of academic courses. Engineering Economics involves a lot of quantitative and qualitative analysis contents. In order to achieve good teaching results, making excellent CAI courseware is an essential link. Courseware making should be focused, hierarchical, and pay attention to systematicness and logic. Of course, courseware is only an outline and main line, for a deeper level, more detailed knowledge points need to be further explained by teachers, can not rely too much on courseware.

4. Cultivation of practical ability of Engineering Economics

(1) Applying the knowledge of engineering economics to related professional problems. The knowledge of engineering economics can be widely used in engineering project management, and many professional contents will more or less include engineering economic analysis and decision-making. The corresponding situation between engineering economics knowledge points and professional problems is shown in Table 1.

Table 1 practical knowledge points corresponding to engineering economics

The content of Engineering Economics	Related professional issues
Identification and definition of Engineering Economic problems	The content of Engineering Project Management
Develop a number of options	Engineering construction technology, engineering structure scheme
Form the cash flow of a viable solution.	Project cost management, statistics, financial management
Economic evaluation of investment schemes	Operational research, project evaluation
Selection and implementation of optimal Scheme	Probability statistics, operational research, simulation
Post project evaluation	Information system, project evaluation

It can be seen that although engineering economics is a basic course, it includes many other courses and has a wide range of applications. Therefore, in order to solve other problems with the knowledge of engineering economics, students must master the steps and procedures of economic decision-making in an all-round way and cultivate good economic analysis ability.

(2) Increase the case discussion and decision-making of engineering economics. It is far from enough to master the knowledge of engineering economics through classroom teaching, especially for postgraduate students, their thinking is active and they have a certain practical ability. Therefore, in order to train students' ability to apply knowledge in books to solve practical problems, it is necessary to increase the teaching links of case discussion and decision-making in order to overcome the problems that students often reflect in their previous studies that can not be applied. The setting process of this link is: the teacher provides the actual case on the spot, the students discuss according to the specific situation, and then carry on the project evaluation and the economic feasibility evaluation and so on. This method can enable students to effectively apply the basic knowledge they

have learned in practice, and draw their own strengths, which not only consolidate what they have learned, systematize their knowledge, but also exercise their comprehensive ability to analyze and solve problems.

5. Conclusion

There is no doubt that the course of engineering economics plays an important role in postgraduate education, and the teaching quality of the course also plays an important role in students' learning. Through the setting of teaching content and the design and improvement of teaching methods, the teacher-led infusion teaching method has been changed to heuristic teaching method and case-based teaching method. It has really improved the students' enthusiasm for learning and changed the way of learning into the way of active learning and autonomous learning. It also comprehensively trains the students' ability to solve problems and to make use of collective strength to innovate. In the future teaching, we will continue to train graduate students under the guidance of the training goal, further improve the teaching of engineering economics courses, and strive to train high-quality technical and economic management talents who meet the needs of society.

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