Research on Case Teaching Reform of Engineering Economics Course

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ABSTRACT

Engineering economics is a professional course with strong practicability. In view of the characteristics of this course, teachers should be the basis of teaching practice. On the basis of case teaching, we need to carry out reforms to meet the needs of China's construction market for complex engineering talents.¹

KEYWORDS

Engineering economy; teaching reform; case teaching.

INTRODUCTION

Engineering economics, as a comprehensive course of economic knowledge, closely combines the reality of economic construction and the development of engineering economics in China, analyses the basic principles, basic knowledge and basic methods of the related economic phenomena, the economic consciousness of training engineers and technicians, and the application of engineering economy. The basic principles and methods of learning play a key role in the analysis of engineering economic problems. This course, based on the combination of engineering technology and economy, uses economic analysis methods to optimize the selection of reasonable projects to achieve engineering technical objectives. Its

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significance lies in maximizing the maximum effective operation of the limited resources. It is also a tool for assisting decision-making. By detailed analysis and comparison, the best scheme is chosen. A scientific basis for decision making by a manager or engineer. At present, the teaching of "engineering economics" in Colleges and universities mainly focuses on the economic evaluation of the construction plan, which provides the basis for the early decision of the project. Therefore, the appropriate combination of case teaching can make the teaching effect significantly improved.

APPLICATION OF TEACHING IN THE COURSE OF ENGINEERING ECONOMICS

With the deepening of the reform of China's socialist market economic system, the problems of engineering economy are becoming more and more prominent. The design of teaching content should be combined with the change of domestic engineering economic situation and the development of foreign engineering economics theory. In view of the characteristics of the course, the following ideas can be taken in the content and structure of the course: first introduce the concept principle, then introduce the method of student calculation, and finally explain it with the project case, in order to improve the students' application ability. Engineering economics is a practical course, mainly aiming at the benefits and costs of engineering design and analysis. The system is measured and evaluated, so it is very practical to guide the economic problems in technical work and to provide a way to deal with the economic problems in the field of construction. In quantitative calculation, the implied economic value is explicitly proposed by the calculation index, and the qualitative explanation should be adopted for the elements which cannot be quantified, and the basis of case teaching is provided. The introduction of cases in teaching can help students to strengthen the understanding of the concept of the curriculum, but also help students to master the application skills of Excel in engineering economics.

TEACHING CASE APPLICATION OF EVALUATION FOR A WATER SUPPLY PROJECT

A city in northern China wants to rebuild the urban water supply project. The total design scale of the project is $15 \times 10^4 \text{ m}^3/\text{d}$. The contents of the project include water intake works, water conveyance projects, water treatment works and urban water distribution network engineering. After the project was completed, according to the demand, the maximum water supply of first years was $12 \times 10^4 \text{ m}^3/\text{d}$, the maximum water supply of second year was $1 \times 10^4 \text{ m}^3/\text{d}$, and the maximum water supply of the design scale was $15 \times 10^4 \text{ m}^3/\text{d}$ in the third year. The daily change coefficient of urban water consumption is 1.3.
Combined with the specific circumstances of the project, the relevant estimation data are as follows:

(1) The total investment of the construction project is 421 million 919 thousand and 300 Yuan, of which the construction investment estimate is 395 million 593 thousand and 200 Yuan, the construction interest rate is 12 million 698 thousand Yuan, and the floating capital is 13 million 628 thousand and 100 Yuan.

(2) The investment required by the project, the local government provided 200 million Yuan, handled according to its own funds; the enterprises owned by the project owned 50 million 88 thousand and 400 Yuan for their own funds; the rest of the funds adopted a long-term loan of 145 million 953 thousand and 200 Yuan from the domestic banks and the annual interest rate of 5.9%. 70% of the working capital, that is, 4 million 88 thousand and 400 Yuan raised by itself, is included in the 50 million 88 thousand and 400 Yuan of self-raised funds.

(3) The total investment of the project is 373 million 460 thousand and 800 Yuan of fixed assets, 20 years of depreciation years, 4.5% of the comprehensive depreciation rate, 16 million 805 thousand and 700 Yuan for depreciation and 3 million 483 thousand Yuan in annual amortization fee.

(4) The project is still calculated with 6% value-added tax rate. The urban maintenance and construction tax is 7% of the value-added tax, and the education fee is added to 3% of the value-added tax. The income tax is 25% of the amount of the taxable profit.

(5) Because the first party of the project sells water treatment to the city water supply and management enterprise, the water supply is the water supply of the water plant, without considering the leakage rate of the pipe network. It is estimated that the water price is 2.7 Yuan /m³.

In the course of the case study, the students are guided to make the project investment plan and financing table, the basic production cost data sheet, the total cost estimate, the profit and profit distribution table, and the loan repayment schedule, and then write the project investment according to the results of the above table. The project investment cash flow statement, the project capital cash flow statement, the financial plan cash flow statement and the balance sheet can be concluded as follows:

(1) Financial profitability analysis: the calculation of project investment financial index FIRR (after income tax): 6.55%, slightly higher than the industry benchmark rate of return 6%; financial indicators FNPV:1899.54 million, greater than zero; investment recovery period (including construction period): 12.24 years to meet the requirements.

(2) Financial solvency analysis and loan repayment: according to the analysis of the debt repayment ability of the project, the loan repayment period of the project is 7.79 years, and the index ICR is more than 1 during the repayment period. DSCR is less than 1 in the first year of production and more than 1 in the following years. It shows that the repayment funds for the first year of production can’t meet the requirement of equal reimbursement in 5 years, but the time of repayment is
satisfied for a total of 8 years, and the solvency of the project meets the requirements.

REFORM OF CASE TEACHING ASSESSMENT METHOD

In order to test the students' mastery of the application in case teaching, in addition to the traditional closed examination and curriculum design, the Excel cash flow generation and index calculation are added to the course design process, and the undergraduate students are required to operate and reconcile some problems in the production of cash flow and the index calculation within the prescribed time. In this way, students' learning enthusiasm has been enhanced, and their operational skills have been improved.

CONCLUSIONS

Engineering economics is a highly practical subject. It requires students to have the knowledge of engineering economy and pay attention to the role of computer in improving the efficiency of generating and analyzing the cash flow of complex projects. The application of case teaching can help students to apply the economic evaluation technology to practice better.

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