

Research and Practice on the Reform of Engineering Economics Teaching Mode

Feng Li

School of Water Conservancy, North China University of Water Resources and Electric Power, Zhengzhou, Henan, 450046, China

Abstract: *Engineering economics, as a core course in engineering management, bears the important task of cultivating students' ability to combine engineering technology with economic management. This paper aims to explore and practice different teaching modes to improve the teaching quality and effect of engineering economics course, and then cultivate students' ability to solve practical engineering problems. The article firstly describes the theoretical basis and implementation strategies of the three modes of case teaching, blended teaching and convergent teaching, and then evaluates the effects of the various modes in the light of the specific teaching practice and puts forward corresponding suggestions for improvement.*

Keywords: *Engineering economics; teaching models; case teaching; blended teaching; convergent teaching*

1. Introduction

In the engineering cost professional curriculum system, engineering economics occupies a pivotal position, as a key technical and economic courses, it covers engineering technology and economic principles, it is a highly practical and comprehensive course^[1], the content of the course organically combines the modern engineering technology and the current economic development trend, effectively broadening the learning perspective of engineering students. In recent years, along with the social pursuit of high-quality development of the times, the concept of the construction of new engineering disciplines has gradually taken root in people's hearts, and the state vigorously promotes the internationalisation of engineering education accreditation, and the research on the educational and teaching reform of engineering majors has also attracted attention, attracting extensive attention and in-depth discussions in academia and the industry^[2]. In this context, the traditional teaching mode gradually reveals its limitations and is difficult to meet the diversified needs of modern engineering education. The construction of professional courses and the reform of teaching are the key links in the cultivation of higher education talents^[3], therefore, vigorously promoting the construction of the new engineering curriculum system, actively innovating the teaching mode of engineering costing disciplines, and opening up a new path to cultivate the new era of composite costing talents have become an urgent task in the field of education.

This paper will focus on the three cutting-edge teaching modes of case teaching, hybrid teaching and integrated teaching, analyse their specific application strategies in engineering economics courses, and comprehensively consider their teaching effectiveness through scientific evaluation means, in order to provide valuable reference and reference for the teaching innovation of engineering economics and even the whole engineering cost discipline, promote the steady improvement of the quality of teaching and learning, and provide more cost-effective teaching tools to meet the needs of the new era. In order to promote the steady improvement of the quality of education and teaching, and to provide the society with more high-quality professionals adapted to the needs of the new era.

2. Theoretical Foundations and Implementation Strategies of Teaching Models

2.1 Case-based teaching model

Based on the basic characteristics of engineering economics which is practical and operable, it is imperative to introduce case teaching method in course teaching. Case teaching mode is to introduce some real or fictional cases in the course of teaching, and guide students to analyse the cases from

multiple perspectives, so as to improve the students' ability to combine theory and practice. In the teaching engineering economics, the introduction of case teaching mode can strengthen students' understanding and application of economic evaluation of projects.

The case teaching mode is based on students' existing cognitive learning theoretical system structure, and focuses on the use of case study as an effective means to enhance students' active learning and in-depth thinking ability. Under this conceptual cognitive model, learning is not a passive absorption of knowledge but rather a dynamic process of active knowledge construction. Within this framework, case studies serve as pivotal elements that establish a tangible contextual platform for student learning. By immersing themselves in these concrete scenarios, learners engage deeply in practical problem-solving activities. This experiential approach enables students to reinforce and consolidate their understanding of conceptual frameworks, normative principles, and established protocols. Through this methodology, learners achieve enhanced knowledge comprehension and flexible application capabilities, while simultaneously facilitating the continuous refinement and expansion of their cognitive architecture. This pedagogical strategy effectively bridges theoretical understanding with practical implementation, thereby promoting the organic development of comprehensive knowledge systems.

Through in-depth analysis and research on the application of case study teaching in engineering economics course teaching, this paper provides a comprehensive and systematic summary of the existing case study teaching implementation strategy, and its general operation steps are shown in Figure 1 as the process framework^[4]. This process clearly shows the key links in the practical application of case teaching mode and the orderly promotion process, for the subsequent teaching practice and theoretical discussion provides an intuitive and detailed reference basis.

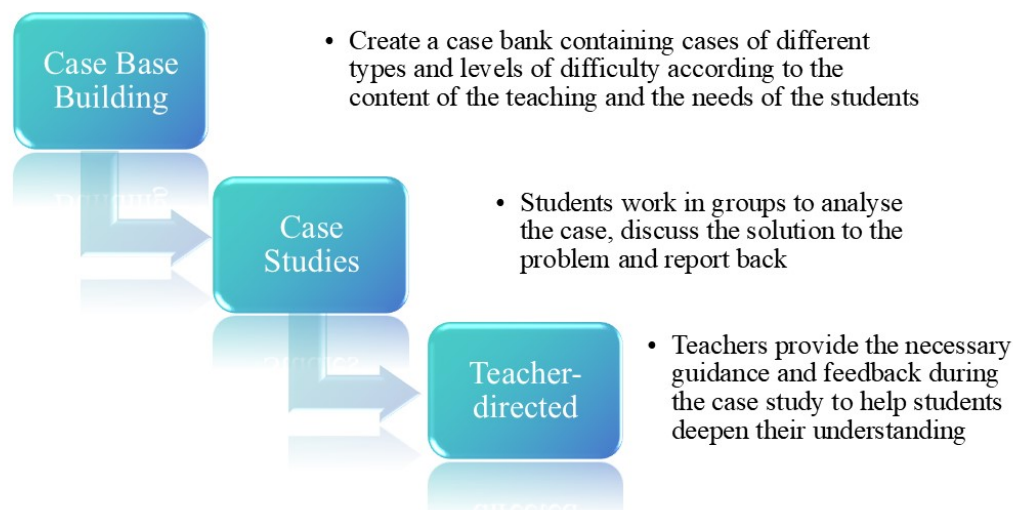


Fig. 1 Flow chart of case study teaching implementation strategy

In today's higher education system, especially under the background of the surging wave of the construction of new engineering disciplines, the reform of the teaching field of engineering cost has become a key task, and the case teaching method is just like a precise and efficient key, which opens a new door to improve the quality of teaching and cultivate the ability of students, and the practical value it contains is inestimable. Case teaching method can not only help students to establish a three-dimensional understanding of engineering economic knowledge, help students form a more complete knowledge chain, but also fully mobilise students' enthusiasm and teamwork spirit, and improve students' ability to analyse and solve practical problems.

2.2 Blended teaching model

Blended teaching is based on the constructivist learning theory, with the help of Internet technology and network terminal equipment, combining traditional teaching with network teaching to achieve a multi-channel, multi-method, multi-style learning mode with students as the main body. The blended teaching mode follows the theoretical foundation that knowledge originates from the interaction

between the individual and the environment, and intermingles with each other so as to build up. In the teaching practice of engineering economics, the blended teaching mode is cleverly introduced on top of the traditional teaching mode, which injects a vigorous and strong power into the teaching process and opens up a new chapter of teaching.

In the practical teaching implementation process of the blended teaching mode, there are three key points, as shown in Figure 2. These elements are interconnected and work synergistically to collectively support the effective implementation of this teaching model, thereby achieving the anticipated teaching objectives and outcomes. First, the construction and operation of the online learning platform: the use of online platforms to provide course resources, including videos, handouts and test questions. Typical teaching means is the use of super star learning through intelligent teaching platform ‘a flat three ends’, using intelligent interaction, big data analysis, cloud computing and other technical means to effectively achieve the teachers, students, learning carriers organic combination of the three [5]. The second is the organisation and implementation of offline interactive discussion sessions: face-to-face classroom discussions, case studies and practical activities, group discussion activities to enhance communication and cooperation among students. The third is the construction and improvement of the teaching evaluation system: the whole process of formative and summative evaluation is carried out through the combination of online and offline, adopting multi-angle and multi-dimensional evaluation, scientifically and reasonably assessing the learning effect of the students, and making the assessment method more open and inspiring the students' thinking.

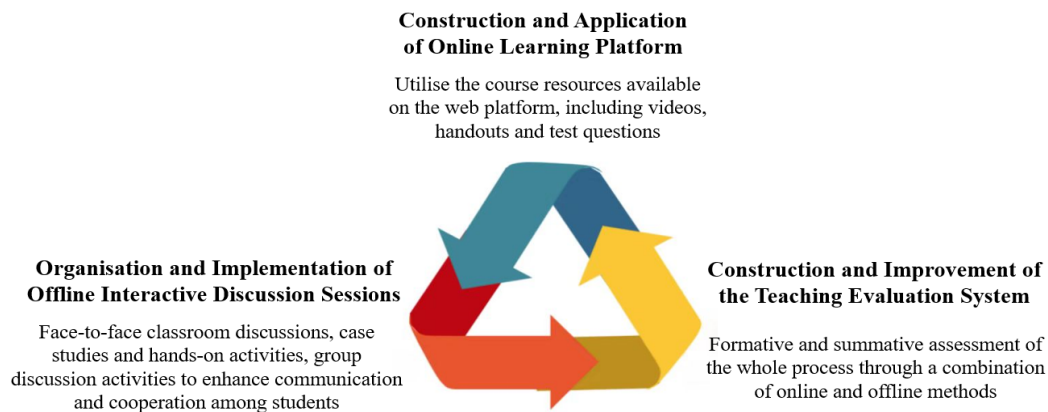


Fig. 2 Three key points of the blended learning model

Considering the significant features of engineering economics, which is highly theoretical and practical, as well as the objective situation that the course content is rich but the class time is relatively insufficient in actual teaching, when implementing the blended teaching mode in this course, we need to focus on the following key points to optimise the teaching effect and enhance the students' learning experience and knowledge mastery.

First of all, efforts should be made to design vivid and fruitful teacher-student interactions. In the teaching process, an interactive mode based on equal dialogue, knowledge sharing and collision of thinking is constructed to enable students to deeply participate in the exploration and construction of knowledge. For example, by organising group discussions, role-playing, situational simulation and other diversified forms of interaction, students are guided to analyse and interpret complex theories and practical cases in engineering economics from different perspectives, which stimulate students' innovative thinking and problem-solving ability, and thus deepen their understanding and flexible application of knowledge in the interaction.

Secondly, we are committed to creating a relaxed and pleasant learning environment full of academic vigour. With the help of multimedia resources, network platforms and other means, to create an open, inclusive and inspiring learning space, so that students can actively explore knowledge in a relatively free and comfortable atmosphere. For example, using online learning communities, forums and other platforms, students are encouraged to share their learning experiences, raise questions and discuss solutions together, stimulate students' interest in learning and independent learning, and cultivate students' teamwork and academic communication skills.

Furthermore, we focus on stimulating students' interest in engineering economics. Combined with the actual cases in the field of engineering, cutting-edge hot issues and industry development trends,

the abstract theoretical knowledge is transformed into vivid and interesting teaching content close to the actual situation, so that students can truly feel the importance and application value of engineering economics in practical work. For instance, incorporating case studies such as economic decision-making analyses for large-scale engineering projects and cost-benefit evaluations of emerging technologies in engineering economics enables students to gain firsthand experience of the discipline's applicability within authentic contexts. This pedagogical approach not only stimulates learners' intrinsic motivation through exposure to real-world problem-solving scenarios but also enhances learning engagement and self-directed initiative. By systematically analyzing these paradigm cases, students cultivate the ability to synthesize theoretical frameworks with practical constraints, thereby establishing a robust cognitive foundation for advanced engineering economic analyses.

Through the above initiatives, on the one hand, it further highlights the students' main position in the learning process and cultivates their ability of independent thinking, independent inquiry and critical thinking. It activates the internal driving force of students' learning, cultivates students' independent and cooperative learning ability as well as their ability to solve complex engineering problems, and meets the cultivation needs of applied talents of engineering management majors in the university.

On the other hand, while ensuring that online learning resources can be fully and efficiently utilised by students, the richness, systematicity and completeness of offline teaching activities are emphasised. Through rational planning of online learning content, the knowledge of the course is fragmented, which is convenient for students to make use of fragmented time for independent learning and knowledge consolidation; at the same time, the offline classroom teaching activities are carefully designed, such as thematic lectures, case studies, practical operations, etc., which organically integrate and deepen and expand the fragmented knowledge, so as to enable the students to build up a complete and systematic knowledge system of engineering economics, achieve the synergistic development of theoretical knowledge and practical ability, and improve their theoretical knowledge and practical ability. It enables students to build up a complete and systematic knowledge system of engineering economics, realise the synergistic development of theoretical knowledge and practical ability, enhance students' comprehensive quality and professional ability, and lay a solid foundation for their future in-depth study and practical application in the field of engineering economics.

2.3 Integrated teaching model

In the theory and practice of education and teaching, the fusion teaching model is defined as a paradigm that organically integrates and synergistically configures multiple teaching methods and diverse teaching activities, aiming to build a highly unified and logically coherent teaching framework system, so as to accurately and efficiently achieve the predetermined teaching goals, maximize the effectiveness of teaching and optimise the quality of teaching in depth. Among the teaching models of engineering economics, typical integrated teaching models include the 'paired classroom teaching model' and the 'cooperative learning teaching model' proposed by Zhang Xuexin of the Department of Psychology of Fudan University. The integrated teaching model upholds the concept of carefully designing and implementing various forms of teaching activities to meet the cognitive, emotional, skills and other multi-dimensional learning needs of different students in an all-round and in-depth manner, so as to tailor-make personalised learning trajectories and growth paths for each student, and thus provide a solid guarantee and strong support for the promotion of comprehensive, balanced and sustainable development of students.

Compared with the traditional teaching mode, the integrated teaching mode pays more attention to the in-depth integration of teaching content, and the teaching characteristics of cross-fusion of disciplines and comprehensive education are also more prominent. Under this teaching mode, the abstract theoretical knowledge and practical skills with strong practicality are systematically and deeply integrated, so that the knowledge of various aspects can be interpenetrated, mutually supportive, and jointly integrated into the overall content of the course of engineering economics. structure. In addition, the diversified use of teaching methods in the integrated teaching mode is also very prominent. During the teaching process, the teaching method is used flexibly and accurately to expound the basic concepts, principles and core knowledge system of the discipline in a systematic and organised way, so as to build a solid knowledge framework for the students. Through the organic combination and synergy of various teaching methods, it can meet the different teaching situations and students' learning needs in Engineering Economics, and enhance the relevance and effectiveness of teaching.

3. Teaching practice and assessment

3.1 Case Study Teaching Model in Practice

According to 'the Application of Case Teaching in Teaching Engineering Economics Courses', the application of case teaching mode in engineering economics emphasises the construction of the case base, the process of case analysis and the guiding role of the teacher. Its core advantage is that it can significantly enhance students' practical ability and problem solving ability. Through the introduction of rich and varied case materials close to actual engineering situations, students can closely integrate the theoretical knowledge they have learnt with practical applications in the process of case analysis and problem solving, deeply understand the connotation and extension of knowledge, and exercise their critical thinking, logical reasoning and ability to cope with complex problems in simulated decision-making scenarios. This process helps students to cross the gap between theory and practice, and cultivate their ability to rapidly and accurately analyse and solve engineering economic problems in future practical work.

However, the successful implementation of the case teaching mode puts high demands on teachers, who not only need to have solid and profound professional knowledge reserves, but also need to invest a lot of time and energy in the careful screening, detailed collation and in-depth analysis of cases, and at the same time need to accurately design the teaching links and guide students to actively participate in the discussion and analysis of the cases, so as to ensure that the teaching process is consistent, inspiring and effective, which increases the teaching burden and preparation for the lessons. This increases the burden of teaching and the difficulty of lesson preparation.

3.2 Blended teaching Model in Practice

According to 'Blended Teaching Design and Practice under the Goal of Efficient Classroom - Taking Engineering Economics as an Example', the application of blended teaching mode in engineering economics focuses on the organic combination of online and offline teaching. The blended teaching mode is student-centred and goal-oriented, which increases students' participation, develops inquiry learning, exercises innovative thinking, facilitates students' in-depth learning, and improves the learning effect. The advantage of blended teaching mode is that it provides students with more flexible, personalised learning methods and learning paths. With the help of modern information technology means, such as online learning platform, virtual classroom, students can break through the restrictions of time and space, according to their own learning rhythm and learning needs, independent choice of learning content, learning time, to achieve the organic integration of online and offline learning. This teaching mode is conducive to stimulating students' interest in learning and awareness of independent learning, cultivating their self-management and information acquisition ability, while also expanding teaching resources and teaching methods for teachers, facilitating the implementation of differentiated teaching and accurate teaching.

The effective implementation of blended teaching mode cannot be separated from stable and reliable technical support and sufficient and abundant teaching resources. From the technical level, it is necessary to ensure the stability, ease of use and security of the online learning platform, the smooth playback of teaching videos, the accurate recording and analysis of learning data, etc. From the resource level, it is necessary to develop high-quality online course resources, such as electronic teaching materials, teaching courseware, online test databases, etc., and integrate offline practical teaching resources, such as laboratory equipment, internship bases, etc., to meet the diverse learning needs of students. Addressing students' heterogeneous learning needs necessitates substantial coordinated investments in human capital development, pedagogical resource allocation, and financial infrastructure by educational institutions and faculty, coupled with sustained institutional commitment to systematic capacity building.

3.3 Integrated Teaching Model in Practice

Under the background of continuous innovation of education and teaching methods, the integrated teaching mode emerges, focusing on cultivating students' comprehensive ability, promoting students' synergistic development in multiple dimensions such as knowledge, skills, emotional attitude and values by organically integrating a variety of teaching concepts and methods, such as paired classroom, cooperative learning, and so on, so as to achieve the goal of improving students' comprehensive quality and optimising the quality of teaching of Engineering Economics courses. In this way, teachers and

students can make significant progress and enhancement under this teaching mode, and jointly promote the effectiveness of education and teaching to a higher level. In the integrated teaching mode, students can actively participate in classroom interaction, group cooperative learning and independent investigation process, improve teamwork ability, communication ability, innovative thinking ability and independent learning ability, to form a more complete and systematic comprehensive quality system, to better adapt to the future complex and changing social needs and career development requirements.

Although the integrated teaching mode has many advantages, in the specific implementation of the integrated teaching mode, there are still some urgent problems that need to be solved, and there are key links that need to be further improved and perfected. In the teaching process, it is necessary to design teaching links and teaching activities in a more detailed way, to ensure that the articulation between different teaching methods is natural and smooth, synergistic and complementary, to avoid duplication or disconnection of teaching content; in the evaluation mechanism, it is necessary to build a set of comprehensive, objective, scientific and diversified evaluation system, for example, in the context of cooperative group learning, some students' independent consciousness is not well behaved, they rely on the group leader too much and fail to give full play to their own independent consciousness. For example, in the group cooperative learning situation, some students have a poor sense of independence, excessive dependence on the group leader, fail to give full play to their own initiative, and contribute less to the group discussion and completion of the task, which undoubtedly affects the effect and quality of group cooperative learning to a certain extent, and adversely affects the achievement of the overall teaching objectives. Therefore, it is necessary to comprehensively consider the students' participation, contribution, knowledge mastery, ability to improve the level of emotional attitude changes and other factors in the learning process, using a combination of formative and summative evaluation, teacher evaluation and student self-assessment and mutual assessment, to ensure that the evaluation results can accurately reflect the overall picture of students' learning and the development of their comprehensive qualities, and provide a strong basis and guidance for teaching improvement and student growth. It provides a strong basis and guidance for teaching improvement and students' growth.

4. Conclusion

To sum up, in the teaching practice of engineering economics, case teaching mode, hybrid teaching mode and integrated teaching mode show their unique advantages and limitations, which together constitute a diversified and complex teaching method system of engineering economics.

The reform and innovation of teaching mode is undoubtedly the key to improve the teaching quality of engineering economics. Through systematic experimentation with diverse pedagogical approaches—including case-based instruction, blended learning models, and integrated teaching frameworks—coupled with comprehensive empirical analysis, this study demonstrates that strategically synergizing the distinctive advantages of various instructional modalities while maintaining rigorous alignment with learners' contextual requirements and course-specific particularities enables the optimized deployment of multifaceted teaching methodologies. Such academically calibrated implementation not only elevates learning outcomes and cultivates interdisciplinary competencies but also propels Engineering Economics education toward enhanced quality standards, operational efficiency, and personalized adaptation. Looking ahead, the teaching reform should continue to explore and optimise the teaching mode, pay close attention to the development of educational technology, the research results of the frontier of the discipline and the development needs of the society and economy, constantly innovate the teaching concepts and methods, improve the teaching system and the evaluation mechanism, better adapt to the development trend of the teaching of Engineering Economics and the needs of the reform, and lay a solid foundation for cultivating high-quality engineering economics professionals with the spirit of innovation, practical ability and international vision. It will lay a solid foundation for the cultivation of high-quality engineering economics professionals with innovative spirit, practical ability and international vision, and make positive contributions to the development of the discipline of engineering economics and the progress of social economy.

References

[1] Du Yujie, Ma Lu, Chang Shan, et al. *Teaching reform and practice of engineering economics course based on OBE concept*[J]. *Science and Education Letters*, 2024,(09):90-94.

DOI:10.16871/j.cnki.kjwh.2024.09.021.

[2] Wei Yuliu, Zhu Xin, Chen Ziqiao. Construction and practice of integrated teaching mode of engineering economics based on 'pair classroom + cooperative learning'[J]. Higher Education Forum, 2024,(10):41-48.

[3] Zhang Ke, Ma Chuang, Zhang Xiaojing, et al. Research on the teaching of engineering economics based on the cultivation of applied talents under the background of new engineering discipline[J]. Henan Chemical Industry, 2021, 38(01):64-66. DOI:10.14173/j.cnki.hnhg.2021.01.016.

[4] Gao Yonghong, Wang Zefeng. The application of case teaching in the teaching of engineering economics course[J]. China Metallurgical Education, 2024, (01):29-32. DOI:10.16312/j.cnki.cn11-3775/g4.2024.01.009.

[5] Li Weili, Shi Wei, Wang Jingjing, et al. Design and practice of blended teaching under the goal of efficient classroom--Taking engineering economics as an example[J]. Journal of Higher Education, 2024,10(09):97-101. DOI:10.19980/j.CN23-1593/G4.2024.09.024.