International Journal of Advances in Engineering and Management (IJAEM)
Volume 6, Issue 06 June 2024, pp: 772-775 www.ijaem.net ISSN: 2395-5252

Application and Practice of Blended Teaching in Engineering Courses

Fulu Wei, Yuxin Han, Yongqing Guo, Dong Guo, Jinbao Zhao，Yikai Zhou

Shandong University of Technology, Zibo, 255000

Date of Submission: 10-06-2024 Date of Acceptance: 20-06-2024

ABSTRACT: Undergraduate education is at the core of talent cultivation and education and teaching. In order to improve the effectiveness of undergraduate teaching in the field of engineering, this study explored innovative educational models in combination with teaching practice. By strengthening the conceptual analysis, knowledge and ability transformation, and ability enhancement in the teaching process, an engineering undergraduate training mode with Chinese characteristics was established. It is compatible with the economic and social development. A blended classroom teaching method has been constructed, through the design of modern teaching methods and new teaching methods. A questionnaire survey was conducted and the reliability and validity of the questionnaire were analyzed. On this basis, the blended teaching mode was designed, which is expected to achieve good results in practice.

Keywords: Undergraduate education; Engineering; Blended learning; Questionnaires

I. INTRODUCTION

"Opinions on Deepening the Reform of Undergraduate Education and Teaching and Comprehensively Improving the Quality of Talent Cultivation" puts forward the idea of deepening the reform of undergraduate education and teaching and cultivating socialist builders and successors who are all-rounded in morality, intelligence, physicality, aesthetics and aesthetics, as well as the Opinions on Promoting the High-Quality Development of Shandong Education in the New Era, which also points out to accelerating the high-quality development of higher education in Shandong. At present, the main teaching method of engineering undergraduates in China still follows the traditional lecturing method and adopts the "teacher"-centered teaching method, which restricts the development of students' thinking and the improvement of their innovation ability. This paper develops a diversified blended teaching method to improve the quality of engineering undergraduate teaching and provide experience for the application of blended teaching in engineering courses, which is based on the unique cognitive learning styles of engineering students.

II. CURRENT STATUS OF RESEARCH ON BLENDED LEARNING

Under the environment of traditional teaching methods, students passively accept knowledge, lack of enthusiasm and subjective initiative in the learning process, which restricts the development of their thinking and the improvement of their innovative ability. To address this problem, domestic higher education workers have tried to develop a variety of teaching methods to enhance students' learning motivation. Guided by the core concept of professional accreditation of engineering education, Zhuang Qifeng et al. applied case-inspired teaching in Principles and Applications of Remote Sensing, which effectively enhanced the teaching effect[1]. Wang Feibing et al. applied the case-based and heuristic teaching methods in agricultural engineering, tried the reform of teaching methods in seed business management course, promoted the case-based and heuristic teaching methods, strengthened the practical teaching link, and cultivated the comprehensive quality of students[2]. Xu Danhong et al. in the food chemistry course using online and offline integration of innovative teaching mode, and the reform of the assessment method targeting the learning process and ability assessment[3]. It can be seen that the construction of an innovative educational model oriented to the thinking of engineering undergraduates plays an important role in improving the quality of training and selecting innovative talents.

III. QUESTIONNAIRE ANALYSIS

3.1 Questionnaire sample statistics

International Journal of Advances in Engineering and Management (IJAEM)
Volume 6, Issue 06 June 2024, pp: 772-775 www.ijaem.net ISSN: 2395-5252

The research objects selected for this paper are undergraduates of engineering majors in six universities in Shandong Province, Jilin Province, Jiangsu Province, Guangdong Province, Hubei Province and Shaanxi Province. Questionnaires were randomly distributed by questionnaire star, and a total of 300 questionnaires were distributed, of which 273 were valid. The questionnaire includes basic information of students, students' teaching style preference, and learning style preference survey.

The basic information statistics of undergraduate students who participated in the questionnaire survey are shown in Figure 1.

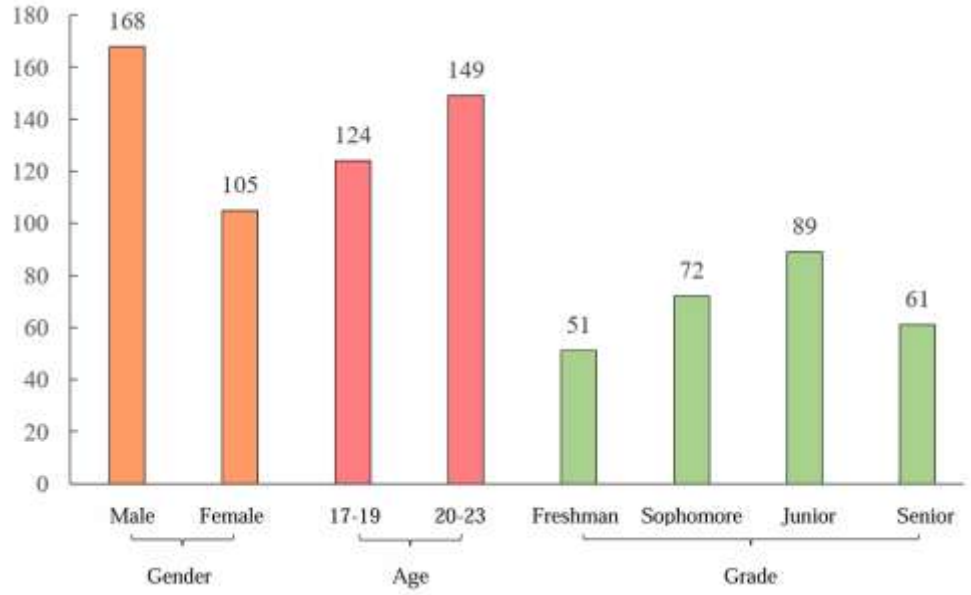

Figure 1 Statistics on basic information of survey respondents

In order to guarantee that the survey respondents can have a certain degree of representativeness, this paper adopts stratified random sampling when selecting the research object, as can be seen from the above figure, the survey sample consists of 168 male students and 105 female students; the number of 17-19 years old is 124, and the number of 20-23 years old is 149; the first year of the bachelor's degree is 51 people, the second year of the bachelor's degree is 72 people, the third year of the bachelor's degree is 89 people, and the fourth year of the bachelor's degree is 61 people. The questionnaire captured students' preferences on teaching style preference and learning style preference by setting relevant questions.

3.2 Analysis of questionnaire reliability and validity

In order to determine the reliability and validity of the results of the questionnaire, this study used SPSS20.0 software to test the validity and reliability of the questionnaire. The Cronbach alpha coefficient method was used to test the reliability of the questionnaire[4], in order to test the stability and consistency of the results, and the test results are shown in the following Table 1. reviewing the relevant information, the Cronbach alpha coefficient has a value between 0 and 1, and it is generally considered that the Cronbach alpha coefficient > 0.7 is an acceptable range[5]. The Cronbach's alpha value of the overall reliability of the questionnaire is above 0.80, and the Cronbach's alpha values of the subscales are all greater than 0.7, at which point the test results are proved to be in an acceptable range[6].

Table 1 Cronbachαcoefficient test

Scales and Dimensions	Cronbach's Alpha
Questionnaire Overall	0.815
Learning Style Preferences	0.832
Teaching Style Preference	0.913
Enhancement Effect	0.946

International Journal of Advances in Engineering and Management (IJAEM)
Volume 6, Issue 06 June 2024, pp: 772-775 www.ijaem.net ISSN: 2395-5252

The results of KMO and Bartlett's test, where the KOM is 0.714>0.5, the sample size is sufficient, Bartlett's test, P=0.000<0.05, which meets the Bartlett's test, the questionnaire is suitable for factor analysis. The specific results are shown in Table 2 below.

Table 2 KMO and Bartlett test

KMO Sample Suitability Quantity		000.714
Bartlett Sphericity Test	Approximate cardinality	491.304
	Degrees of freedom	210.000
	Significance	000.000

IV. DESIGN OF BLENDED TEACHING MODE

According to the results of the questionnaire survey, we use modern network technology, combined with the students' preferred style, to establish a "student-centered" interactive teaching mode[7]. A blended teaching model that integrates multiple teaching methods is constructed with the framework of teachers' pre-course preparation, in-class teaching, and post-course learning, as shown in Figure 2 below.

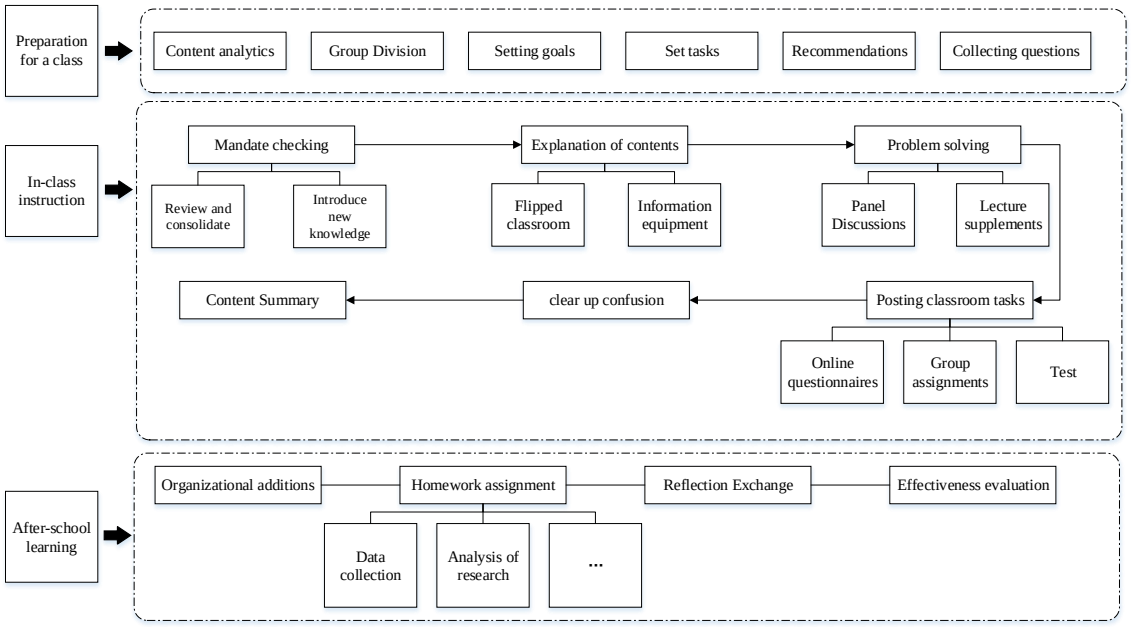

Figure 2 Design of the blended teaching model

According to the students' feedback, it is concluded that the blended teaching method can help students better master what they have learned, and improve the students' learning enthusiasm and initiative through the data expansion, online quiz, etc., which can get a better learning effect.

V. CONCLUSION

Undergraduate education is the foundation of talent cultivation and teaching, and students' learning and mastery of knowledge have a great influence on their subsequent development. In this paper, we conducted a questionnaire survey on undergraduates of engineering majors to obtain students' preferences for teaching and learning methods, and based on the results of the survey, we have established a "student-centered" interactive teaching mode, which provides students with a variety of choices for their learning with the help of modern network technology to enrich the mode of teaching and increase the students' enthusiasm for learning and learning efficiency. It also enriches the teaching mode and increases students' motivation and learning efficiency.

Funding and Acknowledgements

This study was supported by Undergraduate Teaching Reform Project of Shandong Province (Grant Nos. M2022179, Z2023178), and Graduate Education Reform Project of Shandong University of Technology in 2023.

REFERENCE

[1]. Zhuang Qifeng. Practice of heuristic case teaching method in Principles and Applications of Remote Sensing[J]. Science and Technology Wind, 2021, (28):91-93.
[2]. Wang Feibing, Chen Xinhong, Wang Jizhong, Chen Boqing. Reform of Case-based and Heuristic Teaching Methods in Seed Operation and Management Course[J]. Modern Agricultural Science and Technology, 2017(22):285-286.
[3]. Xu Danhong, Wang Lina, Feng Xiaoyang. Application and practice of blended teaching in food chemistry course[J]. Forest Teaching, 2023(11):74-77.
[4]. Zhang Xinyao, Shen Yong, Zhang Jian, et al. Compilation of health information service satisfaction scale for network users and its reliability and validity test[J]. Intelligence Science, 2018,36(03):144-150.
[5]. Liu Na, Bian Caihong, Yang Jinghui, et al. Sinicization of the Ethical Sensitivity Questionnaire for Nursing Students and its Reliability Test in Clinical Practice Nursing Students[J]. Journal of Nursing, 2023, 30(21): 71-74.
[6]. Bi Dandan, Ding Qingwen, Zhang Jiameng, et al. Validity and reliability tests of the Chinese version of the Value Assessment Questionnaire among college students[J]. Chinese Journal of Mental Health, 2021, 35(5): 417-422.
[7]. Yu Peng. Research on the Innovative Development of College Art Education in the Intelligent Era[J]. Advances in Higher Education ,2024, 8(1): 167-169.