Research on the Effect of Electrical Engineering Courses Enabled by Information Technology

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Abstract. To explore the impact of curriculum reform on the quality of education in the perspective of information technology empowerment, we selected a course of Electrical Engineering undertaken as the object of study, focusing on classroom change. The subjects were divided into a reference group and a control group, and the practice group adopted a hybrid teaching mode combined with campus digital means, while the control group adopted traditional teaching, and the two groups were evaluated for their effects after the completion of teaching tasks. The results surface that the practice group is higher than the control group in terms of academic performance, learning ability improvement, innovation potential and course recognition, and the study provides a reference for classroom change in the smart era.

Keywords: Information technology, curriculum reform, teaching effectiveness.

1 Introduction

Artificial Intelligence (AI) is an important driving force leading a new round of scientific and technological revolution and industrial change, which is profoundly changing people's production and life, and promoting human society to usher in the intelligent era of human-computer synergy, cross-border fusion, and co-creative sharing [1]. In the face of the complex globalization process and the increasingly sophisticated demand for innovative talents, the transformation of the original talent cultivation method has become one of the practical problems that need to be solved by countries around the world. The change of social pattern triggered by the new coronary pneumonia epidemic and the deep development of the new generation of artificial intelligence technology have brought far-reaching impact on the field of education [2]. Online teaching with "Internet+" and "intelligence+" technologies has become an important development direction for higher education in China and the world, and it is no longer possible or desirable for us to return to the teaching and learning status before the epidemic [3]. When college students are called "online natives", they are more receptive and adaptable to the education and teaching mode under the perspective of information technology empowerment. However, how to make good use of information technology to upgrade

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education and teaching is still the core content of the current reform of educators, and the evaluation of the teaching effect of courses in the field of information technology empowerment is the key to complete the closed loop of education [4].

The key to change the concept of information technology-enabled classroom lies in the integration of empowering thinking, reconfiguring the original classroom teaching values, and through the action guide and specific actions out based on this. Based on this, Hu Guoliang et al. proposed a model for the construction of a smart learning space for the Open University based on the development and improvement of core literacy and the need for teaching in the post-epidemic period [5]. Li Xiaoping and others proposed relying on the knowledge graph driven VR teaching resources intelligent construction method [6]; Chen Kun and others relying on blockchain technology to build the Civics flipped classroom implementation path [7]; Wang Jian and others will be oriented towards the construction of disciplinary core literacy knowledge graph combined with artificial intelligence technology to carry out accurate teaching practice [8]. The current research on intelligent technology to change the classroom mainly covers the classroom environment, resources and evaluation, but compared with the traditional classroom, there are few studies on the impact of classroom change on student teaching under the perspective of information technology empowerment[9,10]. Based on this, this study takes the practice process of blended teaching and traditional teaching in electrical engineering courses as the research object, focuses on classroom change, and reveals the difference of classroom change on traditional teaching mode under the perspective of information technology empowerment, with a view to providing theoretical reference and practical guidance for classroom change in the intelligent era.

2 Contents and Methods

2.1 Objects of study

In order to explore the impact of curricular change on the quality of course education in the perspective of information technology empowerment, the course of Electrical Engineering undertaken by the faculty of a university in the spring was selected for the study. The basic situation of the course is that the spring course 2022 has a total of 4 teaching classes, and all 223 students are invited to participate in this study. The four natural teaching classes were divided into experimental and control groups during the study, with 114 students in the experimental group, 99 males and 15 females, and 109 students in the control group, 96 males and 13 females. This study was carried out with the consent of all the 223 study participants.

2.2 Research Methodology

2.2.1 Teaching practices in the perspective of information technology empowerment (practice group).

Curriculum change in the perspective of information technology empowerment extends the space-time and spatial dimension of teaching and learning. In the context of the digital reform of higher education, the program relies on the digital construction of

the school, and the digitalization of the curriculum drives the content update of the curriculum. The content organization is based on "student-centered", and the five-stage progressive modular teaching is proposed, which is demand-oriented, and forms five stages of "production, learning theory, practice, competition, and teaching assistant", forming a student-centered blended teaching mode.

Pre-course production to attract interest. The group arranges at least one representative elective production project, the instructor selects students from the previous course cycle as student teaching assistants and co-instructs them, and the instructor evaluates them as a comprehensive evaluation grade for the subsequent course, which is a pre-course task.

Classroom learning and reasoning to promote recognition. Promoting digital teaching reform empowers classroom teaching, utilizing "Super Star, One Level, Three Ends" to realize multi-dimensional synergy in teaching. Diversification of classroom sessions: create case presentations to realize pre-tests for learning, set up doubts and discussions, fine-tuning of new knowledge, quizzes, and mutual evaluation and defense. Diversification of Learning Channels: Provide a variety of learning channels for students with different characteristics, including: textbooks, courseware, online videos, exercises, open experiments, and innovation training. Diversification of teaching activities: online: discussion, voting, quiz, grouping, etc. offline: practice instead of lecture, student lecture and student evaluation, student defense and crowd evaluation, seminars, open lab activities, etc.

Hands-on lab exercises to improve literacy. Completed after class, there are physical experiments, simulated exercises, exercises exercises, cutting-edge and application research reports.

Professional competition to strengthen innovation. Students, or research assistants, or join the competition echelon, linked to the postgraduate course "college students to expand the training" evaluation, but also linked to different grades of students, to enhance the development of academic style, innovative training program workflow.

Assisting students to help education craftsmanship. Students as teaching assistants, join the course group teaching assistant echelon, tutoring some of the lower level course students, tutoring assessment will be used as part of the comprehensive evaluation of the subsequent course.

2.2.2 Traditional teaching control (control group).

Students in the control group received traditional teaching. Teachers and students face to face in the classroom. Before class, the teaching content was clarified, the lesson plan was prepared in detail, and the teaching plan was formulated. In the classroom, the teacher, as the main body of teaching, teaches the teaching content to the students, highlighting the key points and difficulties. Classroom interaction with students takes the form of exercises, questions and so on. After class, the teacher will assign homework for students to complete and then the teacher will review it. Evaluation of students' performance is based on classroom exercises, questions and completion of homework after class.

3 Results & Discussion

3.1 Comparing the assessment scores of the two groups of students

The total score for each assessment is 100 points, including 60 points for usual score and 40 points for examination score. The usual score of the practice group are as follows: teaching assistant/research assistant (15%), production of case presentations (group visit, 15%), classroom mutual evaluation (10%), and post-course results (including experiments, simulations, exercises, and reports, 20%); and the examination score of the practice group are as follows: midterm (15%) and final examination (25%). The usual score of the control group include: students' attendance in class (5%), class exercises (5%), class performance (10%) and post-class results (experiments, 20%; exercises, 20%); the examination score are the same as those of the practice group. The specific results are shown in Table 1.

The results in Table 1 show that at the midterm examination, there is not yet a big difference between the two groups of students in terms of their usual and theoretical grades, and at the final examination, the practical group is higher, and the usual and examination grades have been improved by 3.48% compared to the control group, and the final examination has been improved by 2.97%. From the group, the practical group improved more at the end of the period than at the midterm.

Table 1. Comparison of students' assessment scores ($\chi \pm s$)

Groups	Number of students	Ordinary score		Examination score	
		Mid-term	Final	Mid-term	Final
Practice group	114	52.23±2.23	56.85±4.49	35.13±2.73	38.34±3.21
Control group	109	52.84±2.21	54.79±3.47	35.36±3.20	37.15±4.17

3.2 Comparing the knowledge and ability enhancement of the two groups of students.

The effect of knowledge and ability cultivation of the course is assessed from four aspects, which are divided into four aspects to be analyzed: learning initiative, basic knowledge mastery, engineering problem abstraction ability, and innovation ability. In the assessment, the detailed data of the usual grades support the evaluation of learning initiative and basic knowledge mastery; the scores of the examination paper questions support the evaluation of the abstraction ability of engineering problems; and the innovation ability is assessed by the proportion of the awards won by the students in disciplinary competitions within one year after the completion of the course.

Table 2. Assessment of the program's enhancement of students' competencies

Groups	Number of students	Enhancing Learning Initiative		Enhancement of basic knowledge		Improve abstraction of engineering problems		Enhancing innovation capacity	
		selection	N%	selection	N%	selection	N%	selection	N%
Practice group	114	103	90.35%	106	92.98%	86	75.44%	43	37.72%
Controlgroup	109	89	81.65%	92	84.40%	65	59.63%	26	23.85%

Table 2 shows that the students in the practice group outperformed the control group in the four aspects of learning initiative, basic knowledge mastery, abstraction ability of engineering problems, and complex problem solving ability. It can also be seen that in the subsequent year of study, the innovation potential of students in the practice group is 13.87% higher than that of the control.

3.3 Comparing the two groups of students' recognition of the course

A questionnaire was used to investigate the recognition of the teaching, and the indicators were analyzed in four aspects: course enjoyment, professional knowledge acquisition, professional ability development, and teamwork ability development.

Table 3. Students' recognition of course instruction

Groups	Number of students	Enhancing Course Favoritism		Enhancement of professional knowledge		Enhancement of professional competence		Enhance teamwork skills	
		selection	N%	selection	N%	selection	N%	selection	N%
Practice group	114	111	97.37%	110	96.49%	110	96.49%	112	98.25%
Control group	109	89	81.65%	92	84.40%	85	77.98%	26	23.85%

As can be seen from Table 3, the large differences in the data were in the order of teamwork ability, professional competence and course enjoyment, and the students in the practice group recognized the course more than the control group.

4 Conclusions

From the above data, we can see that the classroom effect is better under the perspective of information technology empowerment. From the perspective of students' performance, students' average grades have been improved; from the perspective of students' ability cultivation, students' comprehensive ability cultivation is better, especially students' innovation potential cultivation is more prominent; from the perspective of students' recognition, students' recognition in the practice group is much higher than that in the control group. The reasons for this are, firstly, the online learning mode triggered

by the new Crown pneumonia epidemic has aroused students' good feelings, and students are more likely to accept the IT-enabled classroom based on IT; secondly, the new means and modes as well as teacher-student interactions of the IT-enabled classroom are more friendly, which have gained the recognition of the students, and the students' motivation is good; and thirdly, the IT-enabled classroom has sufficiently mobilized the students' motivation to learn. Talent cultivation is based on the curriculum, and it is of great significance to realize the change of IT-enabled classroom to educate people and talents in the intelligent era. This study takes the practical process of blended teaching and traditional teaching of electrical engineering courses as the research object, focuses on classroom change, reveals the significance of classroom change for students and teachers in the view of information technology empowerment, and provides theoretical reference and practical guidance for classroom change in the intelligent era.

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