



Research on a Hybrid Teaching Method Based on Big Data Analysis and Informatization 2.0

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Abstract. “Internet + vocational education” under the background of informatization 2.0 has become the mainstream path of professional curriculum construction in higher vocational colleges. From the perspective of specialty system construction in higher vocational education, the core courses of specialty series are determined on the basis of sorting out the target positions of talent training. Under the guidance of relevant theories, taking a course as an example, this paper explains in detail the implementation process of the determination of teaching objectives, the setting of teaching projects and the integration of 1 + x course certificates, and gives the path of course resource construction and the design, implementation and assessment scheme of hybrid course teaching.

Keywords: Promotion of information technology · Class certificate accommodation · Big data · Feature analysis · Informatization 2.0

1 Introduction

The national vocational education reform implementation plan puts forward the requirements of “docking between specialty setting and industrial demand, curriculum content and vocational standards, and teaching process and production process” [1]. The education informatization 2.0 action plan of the Ministry of education proposes to “take education informatization as an endogenous variable of educational systematic reform, support and lead the development of educational modernization, promote the renewal of educational ideas and mode change, and provide Chinese wisdom and Chinese solutions for the development of international education informatization” [2].

Taking the electrical automation technology specialty as an example, this paper determines the professional core courses according to the professional talent training target posts; Taking a professional course “motor and electrical control technology” as an example, this paper illustrates the formation of course content and teaching items, the integration of 1 + x course certificates, the construction of course resources, and the practical process of informatization of teaching process [3, 4].

2 Post Sorting

The major of electrical automation technology was established in 2004. With the advent of the era of industry 4.0 and education informatization 2.0, the demand for high-quality technical and skilled talents in the electromechanical equipment manufacturing industry is becoming more and more urgent [5]. In combination with the characteristics of regional industrial development, the specialty construction starts from the source, reorganizes the orientation of talent training objectives, and adjusts the professional core courses accordingly, so as to lay a good foundation for the implementation of talent training programs and curriculum construction [6].

Through the investigation of graduates, determine the target positions for professional talent training. The formula for the number of graduate samples adopted in this study is:

$$SS = \frac{Z^2 \times p \times (1 - p)}{e^2} \quad (1)$$

In formula (1): SS: number of samples; Z: Z index determined by reliability (such as 99% = 2.577; 95% = 1.96); p: The ratio of positive answers (e.g. P = 50% = 0.5); e: Statistical error (e.g. 5% = 0.05).

The formula for estimating the number of samples (graduates/graduate samples) is:

$$SS_a = \frac{SS}{1 + \frac{SS-1}{nop}} \quad (2)$$

In formula (2): SSA: estimate the number of samples, taking 384.16 here; NOP: the number of parent groups, that is, the total number of graduates surveyed.

The total number of graduates in this graduate employment survey is 271. According to formula (2), the sample = 152, that is, the number of graduates in this survey is not less than 152.

3 Core Curriculum

After the target posts of the talent training program are established, organize the discussion among the course construction experts, core teaching backbones and graduate representatives, reasonably set the key points and integration areas for the connection between the courses and certificates according to the requirements of certificate accommodation, and determine the professional core courses of the talent training program centered on the work tasks, as shown in Table 1.

4 Core Curriculum

After the core series of courses that play a supporting role in professional ability are determined, the major will form a course group according to the existing teaching team and carry out the course construction one by one according to the three-year plan. Here, the course “motor and electrical control technology” is taken as an example to illustrate the specific process of course objective determination and course project setting [7, 8].

Table 1. Core curriculum arrangement (owner-draw)

Course Title	Grade	Semester
Circuit Foundation and engineering application	1	1
Fundamentals and application of electronic technology	1	1
Motor and electrical control technology	1	1
PLC technology and engineering application	1	2
Application of power electronics and frequency conversion technology	2	1
Technology and application of power supply and distribution system in factory	2	1
Installation and commissioning of automatic production line	2	2

4.1 Determination of Objectives

The follow-up survey results of graduates' employment in recent 5 years show that the students majoring in electrical automation technology in our college are mainly engaged in the installation, commissioning, operation maintenance and commissioning inspection of factory electrical systems, electromechanical equipment and automatic production lines after graduation. The course team has established the following teaching objectives on the basis of full discussion, taking into account the requirements of the intermediate maintenance electrician skill certificate examination.

1) Skill objectives:

- a) Be able to correctly operate and use electrical equipment in accordance with the requirements of safe operation specifications.
- b) Be able to correctly use electrical measuring instruments to measure the main technical parameters of transformers.
- c) Be able to assemble and connect the electrical control circuit according to the given motor control schematic diagram.
- d) Be able to use necessary electrical tools and instruments to troubleshoot control circuits.
- e) Have the required operation skills of intermediate maintenance electrician certificate examination.

2) Knowledge objectives:

- a) Be familiar with the structure, working principle and selection method of transformer.
- b) Understand the structure and working principle of three-phase asynchronous motor, and master its operation scheme.
- c) Master the composition and principle analysis of typical electrical control circuit of three-phase asynchronous motor.
- d) Understand the structure and working principle of DC motor, and be familiar with its operation scheme.
- e) Be familiar with the circuit composition of typical electromechanical equipment and master its maintenance methods.
- f) Have theoretical knowledge of intermediate maintenance electrician certificate examination.

3) Attitude goals.

- a) Basic professional quality: abide by working hours and infiltrate the 5S system of the enterprise in teaching activities.
- b) Unity and cooperation ability: be able to carry out division of labor and cooperation according to work tasks and complete work tasks on time.
- c) Accumulate technical data: be able to collect, sort out and archive the data of the work tasks.
- d) Language skills: be able to correctly describe work tasks and requirements, and make work summaries and speeches.

4.2 Project Settings

The core content of the task centered curriculum system is the teaching project. The curriculum teaching project with regional characteristics that can meet the needs of students’ future career development is the key node to guide the implementation of teaching [9, 10]. Its setting directly affects the formation of students’ professional ability and plays a major supporting role in students’ professional ability. According to the job requirements of the target position, the course team, on the basis of full discussion, proposed teaching plan as shown in Table 2 [11].

Through the implementation of the above teaching projects, we will pay attention to the cultivation of students’ professional ability and professional quality, and lay a good foundation for students’ subsequent study of professional courses such as “PLC technology and engineering application”, “factory power supply and distribution system technology and application”, “installation and commissioning of automatic production line”, as well as the migration and sustainable development of future jobs.

Table 2. Teaching programs implemented by different teaching methods (owner-draw)

Teaching methods	Weekly class	Teaching environment	Teaching characteristics
Full offline teaching	6	Implemented in a teaching environment integrating theory and practice	The teacher guides the whole process of theoretical teaching, skill operation, project implementation, and homework review
blended teaching	6	Online Teaching: Smart Vocational Education Mooc Platform	Students mainly watch the teaching videos of knowledge points (skill points) and complete online classroom quizzes, homework, stage examinations
		Offline teaching: implementation in a teaching environment integrating theory and practice	Offline teachers focus on solving difficult problems in theoretical learning and on-site guidance for skill training

Table 3. The resources of each knowledge point(owner-draw)

Resources name	Teaching characteristics
Learning guidance	Introduce key words, key points, difficulties, pre training knowledge, preview content, etc. related to knowledge points
Teaching video	Elaborately designed teaching content, teachers' lecture video shot in 5–10 min
Learning courseware	Ppt documents matched with teaching videos for students' pre class preview and post class review
Knowledge development:	Development materials related to knowledge points are used for students to expand their knowledge
Class quiz	A quiz used to consolidate knowledge learning

5 Development of Resources

In the era of Information Technology 2.0, the development of Internet + vocational education has enriched the choice of teaching means, which can be quickly copied and spread, making the traditional teaching means break through the limitations of time and region. It has become an effective means to promote education equity and improve education quality, and will also provide a strong support for the construction of a ubiquitous learning environment and the realization of lifelong learning for all [12].

“Motor and electrical control technology” is a typical integrated course of theory and practice, which includes not only the basic theory study of transformer and motor, but also the skill training of transformer measurement, motor control circuit installation and debugging, machine tool troubleshooting and so on. According to the course characteristics, it is necessary to develop course resources suitable for online and offline hybrid teaching [13].

5.1 Online Teaching Resources

About 69 knowledge points related to teaching projects are sorted out, and the resources of each knowledge point are as shown in Table 3.

5.2 Offline Teaching Documents

The whole course revolves around 9 teaching projects to build teaching documents such as syllabus, course standards, overall teaching design, teaching unit design, project guidance, skill report, etc.

Syllabus: for teachers, the teaching objectives, teaching contents, teaching methods, teaching plans, bibliographies and teaching environment (including experimental training equipment) specified in the form of an outline.

Course standard: for students, it describes the behavior of students' expected results after learning the course, including learning objectives, learning contents, learning methods, assessment and evaluation indicators, etc.

Overall teaching design: a teaching implementation document prepared in accordance with the requirements of the syllabus and curriculum standards, which includes basic course information, course objectives, teaching projects, learner analysis, learning objectives, course schedule, assessment scheme, teaching methods and learning methods, teaching resources, teaching environment (including experimental training equipment), risk analysis and countermeasures.

Teaching unit design: under the framework of the overall teaching design, the teaching process design for each course includes teaching content, knowledge objectives, skill objectives, attitude objectives, teaching priorities, teaching difficulties, time allocation, teaching resources, assignment, etc. after the teaching is implemented, it is necessary to evaluate the teaching effect and put forward improvement measures.

Project guidance: a detailed guidance document prepared for the skill training projects among the 9 teaching projects selected in the course, including the content and objectives of skill training, the composition of supporting knowledge, environmental requirements, safety precautions, assessment scheme, etc.

Skill report: a skill training report to be submitted by students after the completion of the skill training project, including the project content, training results, experience, problem improvement, etc.

6 Conclusion

According to the implementation plan of “documentary evidence integration” in the training plan, the examination content of intermediate maintenance electrician certificate is deeply integrated with the professional core course “motor and electrical control technology”. The learning contents of the two courses include both the theoretical knowledge and operating skills of intermediate maintenance electricians. After the implementation of the two courses, the examination results of the intermediate maintenance electrician certificate are the direct test of the learning effects of the two courses.

According to the statistics of 632 students majoring in electrical automation technology in the college in recent five years, according to the examination results of intermediate maintenance electricians year by year, the first pass rate of intermediate maintenance electricians after two courses is more than 95%, and the second pass rate of individual students with learning difficulties is 100% with the increase of extracurricular training.

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