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Research on Talent Training Mode of Higher Vocational Colleges Based on New Energy Generation Simulation Platform

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Abstract: "1+X" certificate system innovates the talent training mode which is an important reform measure and system design of vocational education reform, is conducive to the training of high quality compound technical talents. New energy power generation simulation platform can provide a full range of high fidelity power station simulation system, which can effectively support the innovation and reform of teaching methods and improve the teaching effect. Taking a college as an example, this paper analyzes the necessity of implementing the "1+X" certificate system, and takes a series of reform measures such as introducing the simulation platform of new energy generation, forming a set of effective and shareable teaching reform plan, which can be used for reference by similar colleges.

1. Preface

Starting from 2019, the pilot system of "academic certificates + vocational skill level certificates" (hereinafter referred to as the 1+X certificate system pilot) will be launched in vocational colleges and application-oriented universities. [1] "1+X" certificate system, namely "academic certificate + several vocational skill level certificates" system. "1" is educational certificate, "X" is a number of vocational skill level certificates. Academic certificates fully reflect the quality of talent cultivation in school education. Vocational skill grade certificate is the certificate of the professional skill level of graduates and members of society, which reflects the comprehensive ability required by professional activities and individual career development. "1+X" certificate system can fully reflect the basic quality of workers.[2]

The Opinions on Promoting the High Quality Development of Modern Vocational Education issued by the State Council in October 2021 pointed out that vocational education is an important part of the national education system and human resource development, and shoulders the important responsibility of cultivating diversified talents, inheriting technical skills, and promoting employment and entrepreneurship. In the new journey of building a socialist modern country in an all-round way, vocational education has broad prospects and great prospects. The document points

out that we should improve the comprehensive education mechanism of "post course competition certificate", design and develop courses according to the actual production and post needs, develop a modular and systematic training course system, and improve students' practical ability

The "1+X" certificate system is a major reform measure and system design in the reform of vocational education. It is a key link in the implementation of the "post course competition certificate" comprehensive education, which is conducive to deepening the integration of industry and education, school enterprise cooperation, and training high-quality and versatile technical and skilled personnel. Therefore, this research group actively explores and practices the "1+X" certificate training and certification management mode based on the new energy simulation platform.

2. Connotation and main practices

In the "1+X" certificate system, "1" refers to the academic certificate, which fully reflects the quality of talent cultivation in school education. "X" is a number of vocational skill level certificates, which are certificates of vocational skill level and reflect the comprehensive ability required for professional activities and individual career development. It can be divided into three levels: elementary, intermediate and advanced. Students can choose "X" and different grades of "X" according to their interests, specialties, professional level, career planning and actual needs.[3]

"1" is fundamental, subjective and supportive, while "X" is targeted, leading and developmental. "1" is the support of "X", and "X" is an important strengthening and expansion of "1". "1" and "X" are mutually integrated and mutually promoted.[4]

Table 1: Schedules for confirmation of key factors

Serial number	End factors	Content validation	Method of Validation
1	Students have low enthusiasm to participate in competitions	①Check the registration of students over the years	Investigation and analysis
		②View the preparation process information	
2	college organizes fewer kinds of competitions	Check the information of organizing evidence collection and competition over the years	Investigation and analysis
3	Few teaching contents and class hours of supercritical unit boiler	①Check the talent training program	Investigation and analysis
		②Check the corresponding course content and class hour allocation	
4	Few courses of biomass power generation and waste incineration power generation	①Check the talent training program	Investigation and analysis
		②Check the corresponding course content and class hour allocation	
5	No supercritical unit	Check out the student training room	Investigation and analysis
6	No biomass power generation and waste incineration power generation training unit	Check out the student training room	Investigation and analysis

In January 2020, it passed the occupational skill level certificate of "Garbage Incineration Power Generation Operation and Maintenance", which is the first occupational skill level certificate in the thermal power field. The team used QC group PDCA cycle method to analyze the factors affecting the improvement of students' technical skill level from six aspects of human, machine, material, method, environment and measurement, and obtained several end factors in Table 1. Through the investigation and analysis of student training rooms and corresponding talent training programs (Table 2, Table 3 and Table 4), it is concluded that the lack of new energy simulation platform and the shortage of new energy class hours are the main reasons. In view of the main reasons affecting the improvement of students' technical skills, the team carried out project implementation activities in combination with the vocational skill level certificate of Garbage Incineration Power Generation Operation and Maintenance.

Table 2: Utilization of simulation training machine room

Category	Project simulation machine room	supercritical unit	waste incineration generator unit	biomass generator unit
amount	7	2	2	0

Table 3: Distribution of courses of 2018 graduate talent training program

Category	Total number of major courses	The number of courses including Once-through boiler	The number of courses including biomass power generation	The number of courses including on waste incineration power generation
amount	24	1	1	0

Table 4: Distribution of class hours

Category	The number of class hours including the course content of once-through boiler (total class hours of the course are 64)	The number of class hours including the course content of biomass power generation course (total course hours 60)
Classs amount	1	1

2.1 Integrate professional personnel training

The core work of "1+X" certificate system is the talent training program integrating documents and certificates. Only by integrating the "X" certificate training content into the professional talent training program, can the "1+X" certificate system be implemented.

1) Compiled talent training program integrating "1+X" certificate system

The team have comprehensively sorted out the key elements such as the talent training plan, all courses and graduation requirements for the specialty of Power Plant Thermal Power Equipment and

Power Plant Centralized Control Operation in the Department of Power Engineering.

Standard docking. According to professional skill level standards for operation and maintenance of waste incineration generating units, professional teaching standards are connected with professional skill level standards in terms of professional quality, professional knowledge and technical skills. [5]

Integration of course and certificate. According to the standard and professional teaching standards, professional skill level on the basis of the existing teaching content, the certificate required knowledge, skills, and ability and the existing curriculum system, course content, course target, item by item, comparison analysis, determine the standard content has been included in the teaching of vocational skill level, organize special seminars, The other does not cover the content needed to complete the tasks, skills and quality requirements or need to supplement the content of the reinforced part for the power plant boiler - garbage incinerator, the power plant electrical part of the training, the waste incineration power generation unit simulation training courses, such as included in the professional curriculum system, build and certificate system of "1 + X" depth fusion scheme of talent cultivation.

Integration of teaching process. Taking the transformation of knowledge to vocational skills as the goal and as the center, the reform of teaching method should be carried out to achieve the integration of production process, training process and teaching process. Taking the existing waste incineration generator set as the prototype, a typical full-range simulation system for the whole plant of 25MW waste incineration generator set was developed, which simulated the DCS interface and control logic of waste incineration power generation 1:1, and simulated the real centralized control operation and maintenance process of waste incineration power plant. Students and students learned and trained as if they were in the production site.

We also made courseware that reflected the new technology, new process, new standard and new requirement simultaneously. In class, flexible teaching organization forms such as role playing, group discussion and flipped classroom are adopted to innovate teaching methods suitable for vocational skills improvement.

2) Innovate the talent training mode

Explore two talent training modes to obtain "X" certificate. One is to obtain vocational skill grade certificate through training and evaluation; The second is to combine the examination of related professional courses with the vocational skill grade evaluation, and take the examination (evaluation) simultaneously to obtain the corresponding credits of the academic certificate and the vocational skill grade certificate.

2.2 Develop new energy simulation platform

The training and assessment of "X" certificate need the support of high-level practical training base.

Combined with the vocational skill level certificate training and assessment requirements, after strict feasibility study and analysis in the early stage, the team have built two new energy power generation simulation training rooms, supporting 110 machines. Based on the existing waste incineration generator set, a typical 25MW waste incineration generator set full range simulation system is developed, which is 1:1 simulation of waste incineration power generation DCS interface and control logic, with automatic scoring and evaluation system and task-driven teaching and other functions.

The new energy power generation simulation system decomposes the teaching content into several representative tasks and takes the completion of the task as the center of the teaching activities. For example, to start the operation task, the cold start process is divided into several

operation steps. Students and students can view the operation ticket document and operation demonstration. In stand-alone mode, students and students can operate independently without affecting each other. In the cooperative mode, students and students can cooperate to operate the same crew by joining the simulation group. The stand-alone/collaborative mode can not only exercise the independent operation ability of students, but also exercise the coordination ability of students for different positions.

New energy power generation simulation training room is a high level vocational education training base integrating practical teaching and social training, which provides strong support for the public and students in vocational colleges to obtain vocational skill level certificates and enterprises to improve the level of human resources.

2.3 Develop online and offline teaching and training resource databases

1) Develop "X" certificate training and teaching resource database

In order to solve the problem that training cannot be carried out in the training room under special circumstances such as epidemic situation, the team have established the online and offline training and teaching resource library of "X" certificate. The experienced backbone professional teachers gave lectures, completed 39 online lectures, developed 39 teaching courseware, 40 operating tickets, purchased "X" certificate training materials, and set up a question-answering group.

2) Introduction of stand-alone simulation platform and vocational education platform of evaluation institutions

In order to improve the practical operation effect of training and teaching, we introduced the stand-alone simulation training platform of "X" certificate examination and evaluation organization. The stand-alone version of the simulation platform can be installed on the computers of students and students, which is not limited by time and space. Teachers can carry out simulation training online, and students and students can complete simulation training at home or at work. In the process of simulation practice, students can not only practice the simulation system independently through the demonstration mode, but also test themselves. After the test, the system will automatically generate an evaluation report. Students and students can check their score points and points lost through the evaluation report, and the learning effect is remarkable.

In order to facilitate students and students to learn theoretical knowledge, the team also introduced the vocational education platform of assessment and evaluation institutions. You can independently choose the grade of the test for unlimited self-test practice, wrong questions can be collected, repeated practice, greatly improving the learning effect.

2.4 Strengthen the teaching staff

Focusing on the "1+X" certificate system, this project has implemented multiple ways to build a "double-qualified" teacher team.

In order to accurately grasp the advanced concept of "1+X" certificate system and improve professional teachers' ability to implement teaching, training and assessment, The team organized professional backbone teachers to participate in a series of training related to the "1+X" certificate system, such as the "1+X" certificate system learning and exchange lectures, the vocational skill level standard for waste incineration and power generation operation and maintenance (V1.0 version 2020) training, and the first and second phase teacher training for the vocational skill level certificate for waste incineration and power generation operation and maintenance in 2020.

The team have established a teacher innovation team to lead the reform of teaching mode.

The team have hired excellent industry teachers to teach, optimize the teaching team, and comprehensively improve the teaching and training ability of professional teachers.

2.5 Deepening school-enterprise cooperation

School-enterprise cooperation is of great significance in talent cultivation. Through the form of school-enterprise cooperation, the goal of talent training can be more clearly defined, close to the actual needs of enterprises, so that schools and enterprises can give full play to their respective advantages to create good conditions and environment for talent training, and improve the quality of talent training.

The college signed a cooperation agreement with an energy group on targeted training and will add targeted training classes in 2020. The team members and the technical backbone of the energy Group jointly develop special talent training programs, jointly develop courses, integrate educational standards and enterprise standards, and truly achieve the seamless connection between talent training mode and market demand.

3. Conclusion

The team have completed the compilation of the talent training plan and the corresponding curriculum standards integrated with the "1+X" certificate system, which have been reviewed and released by the school successfully.

Four teachers obtained the qualification of assessment of professional skill level certificate of waste incineration power generation operation and maintenance.

Completed the construction of two new energy power generation simulation training rooms. New energy power generation simulation training room is a vocational education training base integrating practice teaching, social training, assessment and evaluation. It will provide strong support for the public and students in vocational schools to obtain vocational skill level certificates and enterprises to improve the level of human resources.

14 students participated in the pilot work of the project, and 10 students successfully passed the vocational skill level certificate of waste incineration power generation operation and maintenance, with a passing rate of 78.6%, far higher than the national average passing rate of 34.01% published by the training evaluation organization.

14 students participating in the project took part in the 2020 National Universities and Universities Centralized Control Operation Technology Contest - Waste Incubation Generator Set, and all won awards, among which 2 won the first prize, 10 won the second prize and 2 won the third prize.The team won the first prize for our guidance and national competition, and 4 teachers of the project team were awarded "Excellent Instructors".

The new energy power generation simulation training platform plays a key role in the completion of the project and greatly improves students' comprehensive skills.

In the next step, the team will consolidate the existing achievements, continue to rely on the simulation platform of new energy power generation, explore the implementation of "credit system" management, develop "modular" curriculum system, establish professional skills courses (elective courses) modules corresponding to different X certificates, and build a talent training program combining multiple "X".

4. References

[1] The State Council. National Vocational Education Reform Implementation Plan [EB/OL].2019-02-13.
[2] Office of Working Group of National Medium - and Long-Term Plan for Education Reform and Development. National Medium - and Long-Term Plan for Educational Reform and Development (2010-2020) [M]. Beijing: People's Publishing House, 2010.
[3] Yiming Zhu, Ruide Wang. Chinese Education Modernization 2035[M]. Shanghai: Shanghai Education Press, 2020.
[4] Zhengde Zeng, Jian Gao. The influencing factors and improving countermeasures of college students' employment

competitiveness [J]. Perspective of Student Engineering,2011,(221) : 167.
[5] Krueger M, Krueger M, Krueger M, et al. Waste incineration and power generation: A review [J]. Beijing: China Electric Power Press, 2020.