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The Insights and Influence of the Sydney Accord on the Teaching Reform of Vocational Education in China: A Case Study of Professional Curriculum Achievement Evaluation

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Abstract: Scientific curriculum evaluation methods are critical for achieving talent training objectives. The Sydney Accord, one of the three major engineering education certification agreements, focuses on the training of "engineering technologists." Its logical system and three core principles align well with the connotation development of professional construction in China's higher vocational colleges, offering significant insights for promoting reform and development in engineering education in Chinese colleges and universities. By incorporating the core principles, elements, and graduate quality defined in the Sydney Accord and focusing on the evaluation of curriculum achievement against "graduation requirements," the quality of vocational education can be enhanced, making it an important direction for future teaching reforms in vocational education.

Keywords: Educational and teaching reform; Curriculum achievement; Sydney Accord; Vocational education

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1. Introduction

Engineering education accreditation is a widely recognized system ensuring the quality of engineering education internationally, forming the basis for international mutual recognition of engineering education and engineer qualifications [1]. Despite having the largest modern vocational education system globally, China has yet to join the Sydney Accord, resulting in a lack of standardized professional certification and international recognition of domestic professional qualifications. The quality of talent cultivation still falls short of market demands. To enhance the evaluation systems of teaching quality and student competencies, and to continuously improve the quality of engineering graduates from higher vocational institutions, encourage vocational colleges to actively participate in establishing substantial equivalence with the international community, provide more development opportunities for graduates, and provide professional and technical talents for the modernization of socialism with

Chinese characteristics and the construction of a community with a shared future for mankind, it is imperative for China to participate in the Sydney Accord. Aligning professional programs with international standards and participating in international accreditation will become an inevitable trend in the reform and development of China's higher vocational engineering education [2].

Scientific curriculum evaluation methods are critical for achieving talent training objectives. Since the 18th National Congress of the Communist Party of China, the government has been paying more and more attention to the negative impact of economic development on the environment, continuing to strengthen environmental governance. With the rapid development of the ecological protection and restoration industry, the market scale continues to expand, and the demand for suitable technical and skilled talents continues to increase [3]. As a new core course of the major of the environmental geological engineering professional group, "ecological restoration technology" is connected with the natural resources ecological protection and restoration industry. Its matching degree between the current assessment and evaluation methods and the needs of industrial positions still needs to be improved. The student-centered and outcome-oriented (training goals and graduation requirements) course goal achievement evaluation method has not yet been formed, and it is difficult to conduct a scientific and effective quantitative evaluation of students' academic performance, subsequent graduation requirements, and training goal achievement.

2. The Sydney Accord and teaching reform in higher vocational education

With the acceleration of globalization, many developing countries have recognized the importance of international education accreditation for the cross-border mobility of talent and the improvement of engineering graduates' quality. The three influential agreements in engineering education accreditation are the Washington Accord, the Sydney Accord, and the Dublin Accord [4]. The Washington Accord focuses on the accreditation of undergraduate engineering degrees (generally four-year programs) and the training of engineers, the Sydney Accord is concerned with the training of engineering technologists (generally three-year programs akin to China's higher vocational education), and the Dublin Accord targets the accreditation of engineering technicians (usually two-year programs) [2,5]. The Washington Accord is connected to China's undergraduate engineering education, while the Sydney Accord is more corresponding and closely related to China's higher vocational education. Although China is a formal member of the Washington Accord, it has yet to join the Sydney Accord. Based on the demand for talent in the social industry, focusing on the current status and challenges of vocational education standards in China and learning from major international accreditation standards like the Sydney Accord, it is possible to improve vocational education standards, optimize talent cultivation quality, and enhance China's international standing in vocational education.

As an important part of the international mutual recognition system for engineering education and engineers, the Sydney Accord's accreditation philosophy and rules are the same as those of the Washington Accord. The formal contracting members implement the principle of substantial equivalence in the mutual recognition of the policies, standards, processes, and results of engineering professional certification, and the core concept is (1) Student-centered, (2) Outcome-based education (OBE), and (3) Continuous improvement. Professional certification and professional construction work mainly revolve around seven core elements. Among the elements, the achievement of graduation requirements is the most important, that is, results-oriented. This achievement will be achieved through the setting of majors, curriculum standards, specific implementation processes, software and hardware support, and internal and external audit systems. The process of talent training includes goal setting, specific implementation, goal achievement, and deviation feedback, and expects schools and teachers

to help students meet graduation requirements through standardized, institutionalized, and quantitative indicator descriptions and working methods.

The Sydney Accord and its graduate quality regulations provide specific standards for engineering education for engineering technicians and are one of the most important criteria for professional evaluation internationally. As the original signatories of the Sydney Accord, the United Kingdom, the United States, Australia, and other Western developed countries have a high degree of compatibility with the Sydney Accord in terms of the core ideas of their talent training model. Most of the research on professional accreditation has specialized accrediting bodies or organizations, such as the Council for Higher Education Accreditation (CHEA) in the United States, the Federal Accreditation Council (AC), and the Tertiary Education Quality and Standards Agency (TEQSA). There are multiple evaluation methods for vocational education quality certification, and the system of professional certification has been based on maturity. However, the specific implementation links and common governance among stakeholders need to be strengthened. These experiences not only point out the direction of the professional construction of higher vocational colleges in China, but also require experts and scholars to focus on building a professional evaluation mechanism with Chinese characteristics based on the core concepts and elements of the Sydney Accord as well as industry standards and the actual needs of society, so as to evaluate whether students have mastered the necessary engineering and technical knowledge, skills, and professional qualities, and ensure that students can be competent for work in the field of engineering and technology after graduation.

3. Practices of Chinese vocational colleges in learning from the Sydney Accord

The Sydney Accord embodies an internationally recognized paradigm whose logical framework and core principles are highly consistent with the connotation development of professional programs in China's vocational colleges. This offers significant guidance for the reform, construction, and development of engineering education in China. At present, the practice of China's higher vocational colleges on learning from the experience of the Sydney Accord is mainly spontaneous, Hong Kong and Taiwan region are ahead in the field of engineering education accreditation. The establishment of the Sydney Accord Applied Research Vocational College Alliance in Nanjing in December 2016 marked the beginning of Chinese vocational colleges' efforts to reference the Sydney Accord model, conducting research and practice in professional construction to achieve substantive equivalence with international standards and promote Chinese vocational engineering education on the global stage [6].

In recent years, Chinese vocational colleges have undertaken extensive practice through model colleges and backbone colleges, gaining valuable experience. Determining professional positioning and developing curricula based on needs has become a basic norm. Under the background of the Sydney Accord and in the context of China's vocational education development, related reforms and studies include but are not limited to exploring reference paradigms for professional construction in vocational colleges, researching the construction of professional curriculum systems, considering talent cultivation specifications, reforming career guidance service systems in higher education, and localizing practices in vocational professional construction. These studies have achieved good results by focusing on the three core principles and seven core elements of the Sydney Accord.

4. Research on curriculum achievement evaluation methods based on the Sydney Accord

The core principle of engineering education accreditation is student-centered education, with educational goals focused on developing students' skills and targeting student learning outcomes. Therefore, teaching evaluation should focus on student learning outcomes and evaluate relevant courses based on graduation requirements. As

important supporting elements for graduation requirements, core courses and practical teaching segments need to be evaluated scientifically and effectively to determine whether course objectives are achieved and to verify the attainment of graduation requirements. This feedback can then inform continuous improvement in teaching content and methods. Traditional methods for assessing teaching effectiveness include score analysis and rubric analysis. High-quality test design, detailed scoring standards, and scientific statistical analysis help determine students' knowledge and skill attainment, providing a basis for improving course teaching. Well-designed rubrics can directly reflect the effectiveness of teaching in experimental and practical segments, guiding student learning more effectively [7]. Currently, the main method for evaluating curriculum achievement is quantitative evaluation based on course assessment results. However, universities often encourage course leaders to explore other reasonable qualitative evaluation methods to comprehensively assess curriculum achievement.

In the evaluation of professional course teaching quality in vocational colleges, diverse curriculum achievement evaluation methods often lead to inconsistent results, causing deviations in subsequent evaluations of professional graduation requirements and cultivation goals. Addressing the existing issues in the methods for evaluating professional course achievement in the context of engineering education accreditation, scholars have conducted a series of studies on specific professional courses based on the OBE concept [8]. Zhang and Wang [9] formed a combined evaluation method for the achievement of curriculum objectives by combining the evaluation results twice to achieve the final evaluation of the curriculum objectives. Dong *et al.* [10] combined quantitative evaluation with qualitative evaluation (student evaluation) to form a set of evaluation methods for achieving curriculum objectives. Yang *et al.* [11] established a scientific and reasonable calculation formula for achievement and formed a standardized and effective evaluation method system for the achievement of curriculum objectives. Jiang *et al.* [12] focused on the determination, decomposition, and corresponding index points and assignment of curriculum objectives, and obtained the achievement value of curriculum objectives through calculation. In the study by Wang *et al.* [13], based on the assumption of overall asymptotic normal distribution, by constructing a new statistic, the problem of finding the cumulative distribution was transformed into the problem of finding quantiles, and the target value of the evaluation of the achievement degree of the course objectives was calculated, and the rationality and effectiveness of the calculation method of the target value were compared and verified from the perspectives of error and actual evaluation effect. Taking the achievement of the relevant professional courses of the environmental geological engineering professional group as an example, the current research mainly includes the following: Sun *et al.* [14] constructed a method for calculating the achievement of the course objectives of "environmental geology" based on the supporting relationship between the course objectives and the graduation indicators and the proportion of the scores in each assessment link. Lyu [15] indirectly optimized the evaluation of the achievement of the course objectives of "Ecological Restoration Theory and Technology" and "Ecological Restoration Engineering" by improving the curriculum assessment.

Although the above studies have made some progress in the evaluation methods for achieving the objectives of related courses, through the analysis of the existing evaluation systems and methods, it can be seen that there are relatively few professional courses involved, the understanding of the core elements of the Sydney Accord is not in place, the evaluation methods are still not uniform, the achievement evaluation mechanism is not perfect, the analysis process is not standardized, and the calculation of some evaluation methods still needs to be optimized. There is still a gap in the research on the achievement of curriculum objectives in many majors and course fields, and the unification of evaluation methods and the establishment and improvement of evaluation systems need to be supported by more pilot studies of professional courses.

5. Conclusion and outlook

Deepening the integration of industry and education is the main thread of vocational education reform and an intrinsic requirement for cultivating high-quality technical and skilled talent. By referencing the core principles, core elements, and graduate attributes of the Sydney Accord, focusing on the evaluation of curriculum achievement against graduation requirements, and analyzing the research outcomes on curriculum achievement in related professional groups, an effective method for evaluating curriculum achievement can be established. This will better assess and track student learning outcomes, provide feedback to improve teaching activities, optimize and perfect the curriculum evaluation system, and enhance the quality of talent cultivation. This will become an important direction for future teaching reforms in vocational education.

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Disclosure statement

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