

Exploration on the Reform Path of "Course-Certificate Integration" in Pharmaceutical Majors in Vocational Colleges Under the "1 Plus X" Certificate System

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ABSTRACT

The "1 plus X" certificate system is an innovative talent cultivation model that adapts to the vocational education in new era. It is an important measure of the vocational education reform in the new era and also a necessary path for vocational colleges to carry out course-certificate integration. Due to the unique nature of the pharmaceutical profession, there are common problems in pharmaceutical vocational education, such as unclear talent cultivation positioning, insufficient practical skills cultivation, incomplete innovative education methods, and inadequate teaching staff level. Under the guidance of the "1 plus X" certificate system, pharmaceutical vocational colleges should seize policy opportunities and carry out reform and innovation in deepening talent cultivation models, construct curriculum systems, cultivate high-quality teacher teams, implement advanced teaching methods, promote the use of excellent textbooks, and deepen school-enterprise cooperation.

Keywords: Vocational education, "1 plus X" certificate, Course-certificate integration, Pharmacy.

1. INTRODUCTION

In 2019, the State Council issued the "Implementation Plan for National Vocational Education Reform", which pointed out that vocational education should be placed in a prominent position in education reform and innovation, as well as economic and social development. Pilot work on "academic certificates + several vocational skill level certificates" (i.e. the 1+X certificate system) should be launched in vocational colleges and applied undergraduate universities. The plan proposed that vocational colleges need to deepen the reform of the training mode for composite technical and skilled talents. On the basis of consolidating students' sustainable development, it is necessary to leverage the role of vocational college education certificates, encourage students to actively obtain various types of vocational skill level certificates through multiple channels while they obtain vocational college education certificates, and expand their employment and entrepreneurship opportunities, so

as to alleviate employment conflicts. At the same time, it is proposed to accelerate the construction of a national "credit bank" for vocational education, establish individual learning accounts for vocational education, and achieve searchable, traceable, and convertible learning outcomes. This is an important measure of vocational education reform in the new era, and also a necessary path for vocational colleges to carry out course-certificate integration.

2. BACKGROUND OF THE "1+X" CERTIFICATE SYSTEM

For the "1+X" certificate system, "1" refers to educational certificates and "X" refers to vocational qualification certificates. For example, pharmaceutical majors with professional skills need to obtain professional qualification certificates such as practicing pharmacists and pharmacists. Academic certificates can reflect the quality of talent cultivation in pharmaceutical majors in vocational colleges and serve as the foundation for students' career development; The vocational skill

level certificate represents the level of students' vocational skills, and the two are a comprehensive reflection of the quality of talent cultivation and personal professional abilities in the talent cultivation process of vocational colleges. In the "1+X" certificate system, "1" is the foundation, and "X" is the deepening and practice of "1". This system does not simply add academic certificates and vocational skill level certificates, but organically integrates the learning process of vocational education with practical skills in industry and enterprise work. This is the process of cultivating students' diversified abilities, and the course-certificate integration is the essence of the "1+X" certificate system.

In the pilot plan of the "1+X" certificate system, the country proposes a requirement to closely integrate the pilot of the 1+X certificate system with tasks such as curriculum construction, professional construction, and teacher team construction, promote the organic integration of "1" and "X", and improve the quality of vocational education and students' technical skills. Through pilot projects, it is necessary to deepen the "three education" reforms, namely teacher reform, textbook reform, and teaching method reform. Teacher reform refers to the inclusion of the 1+X certificate system and related vocational skill training standards in the development of teacher training modules in vocational colleges, with the aim of cultivating a team of teachers with both professional and vocational skills training capabilities to play a leading and exemplary role as an innovative team of high-quality teachers in the pilot work of the "1+X" certificate system; Textbook reform refers to the national planning of vocational education textbooks to adapt to the pilot needs of the "1+X" certificate system, which needs to organically integrate the relevant content and requirements of vocational skill level standards into the textbooks, and comprehensively implement the promotion of textbooks that integrate documentary evidence and course evidence. Teaching method reform refers to the purposeful and selective inclusion of relevant requirements and content of vocational skill level standards in the teaching process of professional courses in vocational colleges during the pilot work of the "1+X" certificate system, to optimize professional talent training plans, and promote the course-certificate integration.

3. CURRENT SITUATION OF TALENT TRAINING IN PHARMACY

With the implementation of the "Healthy China" national strategy and the deepening of medical reform, the aging population, changes in disease spectrum, and the improvement of people's living standards, people's health awareness is gradually increasing, and higher requirements are put forward for the quality and ability of pharmaceutical personnel. The proposal of "Made in China 2025", the rise of Internet of Things technology, and the arrival of the 5G era further promote the transformation, upgrading, and innovative development of modern health service and biopharmaceutical industries. The existing talent cultivation model for pharmaceutical specialty groups is difficult to support the demand for talent cultivation in industrial transformation and upgrading. It is necessary to comprehensively improve the professional literacy, knowledge structure, and information technology application ability of pharmaceutical practitioners. The reform and upgrading of talent cultivation in pharmaceutical specialty groups is imperative.

The National Development and Reform Commission has issued the "14th Five Year Plan and 2035 Long Range Goals Outline", which clearly proposes to "accelerate the development of the biopharmaceutical industry, expand and strengthen the bioeconomy"; "The '14th Five Year Plan' for the Development of the Pharmaceutical Industry" released by Ministry of Industry and Information Technology of the People's Republic of China and the National Development and Reform Commission and other departments pointed out that breakthroughs have been continuously made in the basic research and transformation application of new mechanisms and target drugs, and biopharmaceuticals are deeply integrated with the new generation of information technology. The new generation of biotechnology represented by cell therapy, gene therapy, synthetic biotechnology, and bifunctional antibodies is becoming increasingly mature, providing broad space for the pharmaceutical industry to seize the opportunity of a new round of technological revolution and industrial transformation." This has brought unprecedented development opportunities for the pharmaceutical specialty groups.

At present, the cultivation of pharmaceutical students in vocational colleges mainly relies on traditional pharmaceutical teaching. The talent

cultivation plan replicates the curriculum of undergraduate pharmaceutical courses, mainly based on chemistry, such as analytical chemistry, organic chemistry, pharmaceutical chemistry, etc., with drugs as the learning center and emphasizing theoretical knowledge and technical skills education, while the cultivation of comprehensive qualities such as practical ability and vocational skills is weak and there is insufficient emphasis. The high setting of curriculum is mostly a compression of undergraduate pharmaceutical education. According to survey statistics, the employment directions of pharmaceutical majors in vocational colleges are mainly in the production of chemical raw materials, drug formulation production, drug inspection, drug sales, pharmaceutical logistics, etc. This requires students to possess corresponding professional skills and obtain vocational skills certificates such as drug formulation workers, drug testing workers, and traditional Chinese medicine dispensing workers.

In traditional vocational education and teaching, pharmaceutical majors have problems such as unclear talent cultivation positioning, insufficient practical skill cultivation, incomplete innovative education methods, and inadequate teaching staff. In order to adapt to the innovative development of the modern health service industry and the biopharmaceutical industry, it is necessary to further clarify the positioning of pharmaceutical specialty groups, deepen the reform of talent cultivation models, cultivate pharmaceutical high-quality technical and skill interdisciplinary talents who meet the needs of the times, combine moral and technical education, combine knowledge and action, have an international perspective, have innovation ability and information technology application ability, to meet the talent needs of the transformation and upgrading of the modern health service industry and the biopharmaceutical industry.

4. REFORM MEASURES AND EXPLORATION

Under the guidance of the "1+X" certificate system, pharmaceutical vocational colleges should seize policy opportunities, reform and innovate in deepening talent cultivation models, construct curriculum systems, cultivate high-quality teacher teams, implement advanced teaching methods, promoting the use of excellent textbooks, and deepen school-enterprise cooperation.

4.1 Deepening the Talent Cultivation Model

To meet the needs of China's pharmaceutical industry, pharmaceutical professionals not only need to master pharmaceutical knowledge, but also need to systematically learn other disciplines such as basic medicine, clinical medicine, nutrition, preventive medicine, health science, etc. At the same time, they should pay attention to professional ethics and humanistic literacy, guide patients to use medication reasonably, and improve the overall health literacy of the whole population.

It is necessary to draw on the "dual system" and other models, summarize pilot experience, such as modern apprenticeship system and new enterprise apprenticeship system, school enterprise cooperation, and jointly develop talent training plans for vocational colleges, timely incorporating new technologies, new products, new processes, new standards, etc. into teaching standards and content, guiding students to carry out targeted internship and practical training. For example, when formulating talent cultivation plans for pharmaceutical majors in vocational colleges, vocational skill level certificates such as drug production technology development, pharmaceutical services, and licensed pharmacists should be combined to integrate the cultivation of students' professional skills and practical literacy into talent cultivation goals, and organically connect professional knowledge, practical skills, and talent cultivation. In order to meet the requirements of the national "1+X" certificate system, emphasis should be placed on the course-certificate integration in the curriculum setting. It is a must to incorporate the professional level standards of drug marketing, licensed pharmacists, and pharmacists into core curriculum teaching, construct a talent cultivation model oriented towards the needs of industry enterprises, cultivate pharmaceutical talents who can undertake various types of positions such as drug research and development enterprises, drug sales industry, drug quality control, and drug academic promotion, and achieve the connection between talent cultivation goals and industry needs. [5]

Based on the current background of the "1+X" certificate system, it is a way to collaborate with leading pharmaceutical and modern health enterprises both domestically and internationally to build an industrial college that deeply integrates industry, academia, research, and application, and implement modern apprenticeship training for

pharmaceutical majors. Compared to the cGMP (Current Good Manufacturing Practices) industry standards certified by the US FDA (Food and Drug Administration) and the European Medicines Agency (EMA), and based on the commonly used professional standards and professional teaching standards for pharmaceutical manufacturing in China, and closely combined with the actual employment situation of pharmaceutical enterprises, as well as guided by the classification theory of vocational education goals, there is a must to collaborate with relevant enterprises to develop standards for cultivating high-quality technical and skilled talents in pharmacy. It will be an approach to collaborate with leading enterprises in the pharmaceutical industry to develop vocational skill level standards for pharmaceutical specialty groups, participate in vocational skill level certificate training and assessment work, introduce widely recognized domestic and foreign enterprise training certificates, and integrate them with teaching plans and content to carry out certificate training or assessment. It will be necessary to innovate and promote the cultivation mode of high-quality technical and skilled interdisciplinary talents, cultivate high-quality technical and skilled interdisciplinary talents who possess both morality and technology, knowledge and action, transferability, and international perspective.

4.2 Building a Pharmaceutical Specialty Groups Curriculum System of "Course-Certificate Integration"

It is a must to deepen the cooperation with Chinese and foreign pharmaceutical enterprises, dynamic introduction, absorption, integrate high-quality teaching resources in China and overseas, and continuous upgrade vocational education teaching resource library, upgrading from a single professional resource library to a professional group resource library, upgrading from single language resources to bilingual resources, and building new resources such as videos, animations, cases, micro courses, personalized courses, virtual simulation software, etc., so as to provide shared high-quality educational and teaching resources for both Chinese and international students and practitioners. Relying on the resource pool to jointly build and share alliances, it is necessary to establish a sustainable resource application and promotion mechanism [2].

According to the talent needs of the modern pharmaceutical industry for professional positions

such as drug research and development, production, testing, circulation, and use, the training content of the "x" certificate should be integrated with the professional curriculum system. It is of great significance to implement the "five docking", namely the docking of professional settings and industries, curriculum standards and vocational standards, teaching processes and actual production processes, educational certificates and vocational skill level certificates, and Chinese and international standards. Based on the systematic training of seven skills, including "professional literacy, innovation and entrepreneurship ability, modern information technology ability, pharmaceutical basic experimental skills, job group professional skills, vocational comprehensive skills, and 1+X certificate skills", a specialty groups curriculum system integrating "bottom level sharing", "middle level integration", and "upper level mutual selection", "five docking", and "course post certification competition", will be constructed for pharmaceutical specialty groups. It is also necessary to integrate the "1+X" certificate skill standards into the relevant professional curriculum system and content through methods such as "replacement, addition, and reinforcement", innovate the training mechanism of "promoting teaching through competitions, learning through competitions, and certification linkage", and comprehensively improve students' professional literacy and abilities.

4.3 Promoting the Three Education Reform

The "three education" reform is an important path to deepen the reform of the 1+X certificate system and talent cultivation model, aiming to improve the adaptability of vocational education talent cultivation through the integration of courses and certificates and the combination of education and training. Based on the current insufficient competence of teachers in the 1+X certificate system, weak adaptability of textbooks, low integration of course certificates, separation of teaching methods and training, and weak digital application ability, vocational colleges should build a "double-qualified" teaching team in order to adapt to social change, construct three-dimensional textbooks based on the principle of integrating course certificates, and adopt a mixed teaching mode of combining education and training and digital empowerment.

4.3.1 *Teacher Reform*

The foundation of talent cultivation is a team of high-quality teachers. Under the "1+X" certificate system, vocational colleges need to cultivate teachers with vocational skill level certificate training capabilities, establish high-level teacher innovation teams that combine professional abilities and vocational skill literacy, and divide and collaborate with teachers for modular teaching. Schools should flexibly attract high-end talents, implement a dual professional leader system for schools and enterprises, and build a renowned teacher studio and a skilled master studio. Taking the six abilities of teachers, including "ideological and political education, teaching, specialty construction, entrepreneurship and innovation guidance, scientific research innovation, and social service", as the starting point, and guided by ability evaluation, it is a must to deeply promote the five step progressive training, establish quantitative scoring standards, and form a three comprehensive construction pattern of "comprehensive ability training, comprehensive quantitative difference assessment, and comprehensive integration and effectiveness transformation".

By increasing the proportion of "double qualified" teachers and sending teachers to frontline positions in the enterprise industry for internships, it is aimed to provide a five level progressive training program for full-time and part-time teachers, including "rookie, qualified, backbone, leader, and expert", to create a high-level double qualified team with both moral and artistic qualities. At the same time, industry experts should be also involved in various aspects of teaching content, combining industry and enterprise talent standards with vocational college talent cultivation plans. Talent flows in both directions between schools and enterprises, resource sharing, and teaching content need to be aligned with the latest technical standards to cultivate students' actual vocational and technical abilities. Public recruitment can be conducted through direct investigation of high-level and highly skilled special talents. Therefore, it is necessary to establish and improve the management measures for independent recruitment of part-time teachers in vocational colleges, and promote the two-way flow of high-quality teachers in vocational colleges and high-tech talents in enterprises.

4.3.2 *Teaching Method Reform*

There will be a necessity to adopt flexible and diverse teaching methods to promote students' independent learning, ubiquitous learning, and personalized learning based on the characteristics of different sources of students such as full-time vocational education, comprehensive training, and social personnel.[1] Relying on platforms such as the National Medical Professional Teaching Resource Library and the Smart Vocational Education Platform, and based on the dynamic learning data analysis of users in the platform, it will be easier to achieve data-driven teaching decisions, real-time evaluation and feedback, three-dimensional communication and interaction, and intelligent resource push, and establish a learning environment conducive to communication, cooperation, and meaning construction. By using teaching methods such as exploratory, blended, flipped classrooms, and real-life scenarios, it is aimed to strengthen problem-based, project-based, and case-based online and offline blended teaching, implement three-dimensional teaching of "teaching, learning, practicing, researching, and creating", construct a smart teaching model that conforms to the personalized growth laws of students, promote the normalization of information technology teaching, and achieve the coverage of smart teaching models for core courses of pharmaceutical specialty groups.

It is necessary to establish and enrich a professional teaching resource library, and further expand the promotion and coverage of high-quality professional teaching resources by establishing resource authentication standards and transaction mechanisms for shared platforms. It is also necessary to open online high-quality courses for vocational education, develop school enterprise "dual" planning textbooks, advocate the use of work manual style and new forms of loose leaf textbooks, and develop high-quality teaching information resources. Relying on the Construction Committee of Medical Professional Teaching Resource Database, Curriculum Alliance, and Vocational Education Group, the schools should jointly establish credit management, credit mutual recognition operation rules, and other credit mutual recognition mechanisms with member units of the alliance. The schools should also build a "course supermarket" consisting of training courses on humanistic literacy, professional foundation, professional core, innovation and entrepreneurship, and vocational skill level certificates by utilizing

the pharmaceutical professional teaching resource library and smart vocational education platform, and implement credit recognition, accumulation, and conversion to build a lifelong learning overpass and meet the diverse needs of learners through the national "credit bank", to realize mutual recognition of vocational skill level certificate training, continuing education, and academic education credits between units.

It is quite necessary to implant ideological and political elements in the curriculum, integrate advanced standards from enterprises (hospitals), link "textbooks resources platforms", build a multi-dimensional and three-dimensional textbook system that integrates "books, posts, courses, and networks", create a hybrid series of "golden courses" online, offline, and online-offline integrated, to meet the needs of different levels (secondary vocational, vocational, and vocational undergraduate), different majors, different levels (students, enterprise employees, and social personnel), and different regions, and implement personalized combination teaching to energize the value shaping and knowledge transmission of pharmaceutical majors.

4.3.3 *Textbook Reform*

It is a must to create a characteristic course of integrating morality and technology into work literacy, using volunteer service as a carrier to achieve deep integration of professional skills and labor practice, cultivating morality and beauty through labor, and cultivating students' comprehensive cognitive abilities. It is also necessary to create a new form of integrated teaching material system that includes resource library supporting textbooks, planning textbooks, workbook style loose leaf textbooks, bilingual textbooks, "1+X" certificate training textbooks, etc.; Through exploratory, mixed, flipped classroom, and real-life scenario practice teaching forms, the schools can carry out online and offline, virtual and real combination smart teaching, and achieve the smart teaching mode to cover the core courses of pharmaceutical professional groups; They can also build "course supermarkets" consisting of professional core, innovation and entrepreneurship, and vocational skill level certificate training courses, establish a credit file and credit management mutual recognition mechanism, promote credit recognition, accumulation, and conversion, and strive to achieve mutual recognition of credits and training certificates

between hidden units, and build a lifelong learning overpass. On the basis of upgrading and building a national professional teaching resource library, there is a must to focus on creating five types of "golden courses" (online, offline, hybrid online and offline, virtual simulation, and social training golden courses), promote the internationalization process of specialty groups course construction, and customize and develop bilingual courses and English online training courses for specialty groups, as well as to form a high-quality online open course group (Golden Course Group), leading the construction of golden course construction for pharmaceutical specialty groups. At the same time, high-quality resources will be radiated to learners in remote mountainous and poverty-stricken areas, achieving educational poverty alleviation and promoting educational equity.

4.3.4 *Deepening School-Enterprise Cooperation*

It will be of much significance to deeply integrate industry and education, deepen the dual ownership of sports personnel in schools and enterprises, and implement the "Eight Commons": commonly formulating professional standards, talent training plans, cultivating teachers, building bases, optimizing resources, cultivating talents, ensuring quality, and achieving employment. The schools need to actively provide the necessary courses, teachers, and other resources for enterprises, and enterprises utilize their own advantageous resources, including technology, equipment, personnel, and market, to participate in school-enterprise cooperation and promote the reform of talent cultivation models.

The schools can invite industry and enterprise experts to participate in the talent major setting, training mode formulation, curriculum standard setting, and practical content design of vocational colleges, ensuring that the major setting is in line with the industry, talent training goals are in line with industry needs, curriculum standards are in line with professional standards, and teaching content is in line with professional needs. It is necessary to guide employers in the industry to deeply participate in the construction of on-site and off-site training bases, leverage the advantages of diverse educational entities, and substantially promote collaborative education. For example, in collaboration with large Chinese pharmaceutical enterprises, the concept of "new retail" of drugs can be introduced to jointly build an O2O (online-

offline) pharmaceutical service and pharmaceutical marketing industry education integration training base, develop pharmaceutical marketing competition software with software companies, jointly create brand chain demonstration pharmacies named by the enterprise, and assist licensed pharmacists in conducting comprehensive training programs such as online drug purchase, consultation, prescription review, offline recommendation of drugs, pharmaceutical services, and pharmacy management, so as to enhance students' abilities in pharmaceutical services, pharmacy operation and management, and pharmaceutical e-commerce operations. The following approaches can also be adopted, such as, creating practical teaching conditions that combine education and training, serving the cultivation of regional general practitioners, integrating existing practical teaching resources of various majors, and collaborating with industry leading enterprises to build a smart medical practical teaching base. With the concept of "service industry, intensive construction, and open sharing", it will be a must to upgrade and integrate existing practical teaching resources, build campus practical teaching bases that meet the needs of professional group talent cultivation, medical humanities training platforms, single skill training platforms, comprehensive skill training platforms, and service specialty groups interdisciplinary talents cultivation needs.

It can also be a way to collaborate with leading enterprises in the Chinese pharmaceutical industry to develop national "1+X" certificates in the pharmaceutical industry, conduct training and evaluation of "1+X" certificates for teachers and students, and promote their application in applied undergraduate, vocational and secondary vocational colleges nationwide; The schools can carry out job competency training for enterprises and grassroots medical and health personnel, science popularization education for community residents, technology poverty alleviation for farmers, and high-level social services for universities. Enterprises and vocational colleges can carry out industrial innovation, and vocational teachers also participate in employee training, further deepening cooperation between schools and enterprises, and cultivating high-level skilled talents with both professional knowledge and vocational skills.

5. CONCLUSION

Against the background of the "1+X" certificate system, the training mode of pharmaceutical

professionals in vocational colleges is also undergoing reform. To meet the needs of China's pharmaceutical industry, pharmaceutical professionals not only need to master pharmaceutical knowledge, but also need to systematically learn other disciplines such as basic medicine, clinical medicine, nutrition, preventive medicine, health science, etc. At the same time, they should pay attention to professional ethics and humanistic literacy, guide patients to use medication reasonably, and improve the overall health literacy of the whole population. It is necessary to clarify the positioning of the pharmaceutical professional group, adapt to the needs of industry enterprises, achieve the alignment of teaching standards with professional standards, and construct a pharmaceutical professional talent training plan based on the "1+X" certificate system. According to the talent needs of the modern pharmaceutical industry, it is also necessary to integrate the training content of the "x" certificate with the professional course system, build a professional group course system that integrates the "course post certificate competition", and implement the "five docking". There will be a must to promote the reform of "three education", cultivate teachers with vocational skill level certificate training ability, form a high-level teacher innovation team that combines professional ability and vocational skill literacy, and divide and collaborate with teachers for modular teaching; There will also be a necessity to adopt flexible and diverse teaching methods to promote students' autonomous learning, ubiquitous learning, and personalized learning based on the characteristics of different sources of students in full-time vocational colleges, comprehensive training, and social personnel; It is of great significance to create a characteristic course of integrating morality and technology into work literacy, using volunteer service as a carrier to achieve deep integration of professional skills and labor practice, cultivating morality and beauty through labor, and cultivating students' comprehensive cognitive abilities. It is necessary to deepen cooperation between schools and enterprises, deepen the integration of industry and education, deepen the dual focus of sports personnel between schools and enterprises, and implement the "Eight Commons", namely jointly formulating professional standards, talent training plans, cultivating teachers, building bases, optimizing resources, cultivating talents, ensuring quality, and achieving employment. It is also a must to cultivate pharmaceutical high-quality technical and skill interdisciplinary talents who

meet the needs of the times, combine moral and technical education, integrate knowledge and action, have an international perspective, have innovative capabilities, and the ability to apply information technology.

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