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Building Dental Technology Specialty Clusters under the "New Medicine" Initiative: Cluster Logic, Digital Curriculum Reconstruction, and Industry-Embedded Training Bases in Chinese Higher Vocational Colleges

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Abstract: ***With the continuous advancement of medical technology and the growing demand for healthcare services, the development of "New Medicine" disciplines has become a prominent issue in medical education in China, particularly as the dental prosthetics sector has expanded into a market exceeding 120 billion yuan with an annual compound growth rate above 15%.Against this backdrop, the construction of medical specialty clusters in higher vocational colleges is of particular importance. Taking the dental technology specialty cluster as a case study, this paper explores pathways for developing medical specialty clusters in higher vocational colleges from multiple dimensions, including cluster formation logic, program design, teaching resources, and the construction of practical teaching bases. The study aims to provide a useful reference for the development of dental technology specialty clusters in higher vocational education.***

Keywords: New Medicine, Higher vocational education, Dental technology specialty cluster, Cluster formation logic.

1. Introduction

The construction of new medical sciences is an important part of the national development strategy, aiming to improve the level of medical services and the quality of talent cultivation in China. At present, problems such as the imbalance between the supply and demand of medical talents and the uneven distribution of medical resources still exist in China. As an important channel for cultivating medical talents, the construction of medical professional groups in higher vocational colleges is of great significance. Therefore, studying the construction path of medical professional groups in higher vocational colleges has important practical significance.

2. The Connotation of the Construction of New Medical Sciences

The construction of new medical disciplines is the latest requirement of the state for the development of medical education in the new era. It is to reshape the medical system based on the concepts of human body understanding, modeling, and optimization to adapt to the development of the new era's scientific and technological revolution, life sciences, medicine, and education models. It is an important foundation for the Healthy China Strategy. The new medical disciplines emphasize the continuous innovation and development of medical education under the guidance of new concepts. Improving the quality of talent cultivation is the fundamental purpose of building new medical disciplines. It is necessary to achieve the training goals centered on students and competency-oriented, cultivate more outstanding medical talents, and serve the health of the whole people and social development. The new medical disciplines integrate the technologies of the new round of scientific and technological revolution and industrial transformation, promoting the integration, complementarity, and practice of medicine with engineering, science, informatics, and humanities, achieving a qualitative leap based on traditional medicine. The professionalism of the new medical disciplines also requires the development of new specialties such as precision medicine, translational medicine, and intelligent medicine to meet the diverse needs of society for medical services. The new medical disciplines have established new educational concepts of innovation, technology, and comprehensiveness, requiring the construction of a new professional structure with interdisciplinary integration, exploring new models of professional construction that meet the needs of the new era, and building a new medical education system with Chinese characteristics.

The construction of new medical disciplines is characterized by new concepts, new backgrounds, and new specialties. Specifically, the connotation of the construction of new medical disciplines is mainly reflected in five aspects: new concepts, new structures, new models, new qualities, and new systems. First of all, the concept of the new medical disciplines is brand new. In the past, medical education mainly focused on treatment, but now medical education needs to shift the focus to prevention and health care, highlighting the concept of big health throughout the life cycle and the entire process of health. This means that medical education needs to cultivate students' comprehensive understanding of health, pay attention to disease prevention, extend lifespan, and improve quality of life. Secondly, the background of the new medical disciplines is brand new. With the rapid development of artificial intelligence and big data, we are facing a new round of scientific and technological revolution and industrial transformation, and these new technologies will profoundly affect medical education and the medical industry. Therefore, the construction of new medical disciplines needs to keep pace with the times, adapt to the development trend of new technologies, and provide students

with advanced medical knowledge and skills. Thirdly, the professionalism of the new medical disciplines is brand new. Traditional medical majors only focused on the imparting of medical knowledge, but the new medical disciplines require the integration of medicine with disciplines such as engineering, science, and literature. This means that students need to have interdisciplinary abilities to handle complex problems in the medical field.

Developing new medical sciences should focus on future medical development, establish the concept of "big health and big hygiene", take cultivating virtue through education as the foundation, focus on cultivating job competency, adhere to "student-centered, outcome-based, and continuous improvement", promote the deep integration of modern information technology and medical education and teaching, and establish a "new medical sciences" talent cultivation system that adapts to the "biological-psychological-social-environmental" medical model and serves the entire life cycle of health and the whole process of health.

3. Significance of the Construction of Medical Professional Groups in Higher Vocational Colleges under the Background of New Medical Sciences

3.1 Cultivating High-quality and Compound Medical Talents

Higher vocational colleges are important positions for cultivating high-quality and applied medical talents. By constructing medical professional groups, higher vocational colleges can integrate resources, provide more comprehensive and in-depth medical education, and cultivate medical talents with solid medical theoretical knowledge and rich practical experience. Medical talents not only possess professional knowledge but also teamwork and innovation abilities, and can adapt to the rapid changes and challenges in the medical field. At the same time, with the continuous progress of comprehensive development, medical work positions are no longer single-content, but also need to integrate other professional knowledge and skills. With the rapid development of medical technology and the increasing growth of medical needs, the traditional medical work mode can no longer meet the requirements of modern medicine. Modern medical work requires more comprehensive abilities and interdisciplinary cooperation. In the future, the demand for compound talents in the medical field will be greater and greater. Compound talents not only possess medical professional knowledge and skills but also professional knowledge and skills in other disciplines. The construction of professional groups can provide opportunities for multi-disciplinary cross-learning and practice, enabling students to access knowledge and skills in different disciplines. Such an educational model can cultivate students' comprehensive abilities and teamwork spirit, making them the compound talents required in the future medical field.

3.2 Improving the Quality of Medical Education and Promoting the Development of Colleges and Universities

Medical education, as an important link in cultivating medical talents, plays a crucial role in improving the quality of medical services. The construction of professional groups in higher vocational colleges can optimize the allocation of educational resources, provide more advanced and professional teaching facilities and equipment, introduce excellent teaching staff, offer courses and practical links that are more in line with actual needs, thus improving the quality and level of medical education. At the same time, the construction of medical professional groups can promote interdisciplinary integration, achieve resource sharing and complementary advantages. Higher vocational colleges' medical majors can establish multidisciplinary medical teaching teams, give full play to the advantages of each major, and provide more comprehensive and integrated medical education. In addition, the construction of medical professional groups can also promote the improvement of scientific research and innovation capabilities. By building medical professional groups, higher vocational colleges can provide richer scientific research resources and platforms, build bridges for academic exchanges and cooperation, promote interdisciplinary and inter-institutional cooperation in medical research, and promote the transformation and application of medical research results. By establishing scientific research platforms and carrying out scientific research cooperation, higher vocational colleges can attract more outstanding scientific research talents, promote the innovation and development of medical science and technology, and enhance the academic reputation and influence of the colleges.

3.3 Addressing the Imbalance between the Supply and Demand of Medical Talents

Currently, the imbalance between the supply and demand of medical talents is widespread, especially the shortage of medical talents in rural and grass-roots medical service centers. On the one hand, the demand for medical services is growing rapidly, and problems such as difficult access to medical treatment and high medical costs for patients are becoming increasingly prominent; on the other hand, the cultivation speed of medical talents is relatively lagging, and there is a shortage of professional talents such as doctors and nurses. This supply-demand imbalance has had a negative impact on the quality of medical services. The construction of professional groups in higher vocational colleges can not only help improve the quality and quantity of medical talent cultivation by training medical talents, but also enhance the level of medical services and meet the needs of the people for medical services. At the same time, by closely cooperating with medical institutions and communities, higher vocational colleges can carry out services such as health education and health management to improve the health awareness and health literacy of the public.

3.4 Improving Professional Setting Requirements and Forming Market Advantages

With the increasing demand for medical talents in society, the need for professional settings in medical vocational colleges has become more important. To maintain the stability of their own majors, medical vocational colleges need to carry out major settings and layouts according to the division criteria of major groups, and they should be flexible to adapt to market

demands and meet the special needs of vocational colleges. Medical vocational colleges can develop around a certain core goal according to major groups: by closely cooperating with relevant industries and enterprises to understand market demands and industry trends, medical vocational colleges can better grasp the direction of major settings and ensure that the development of majors matches social needs. To enable major groups to form a market advantage, improve the quality of teaching resources, pay attention to market changes, focus on cultivating students' employment competitiveness, and focus on international development. Only in this way can major groups closely integrate with the market situation, provide talents that meet market demands, and thus form a market advantage.

4. Three Paths for Constructing Medical Major Groups

4.1 Clarify the Basic Logic of Grouping Majors and Construct an Integrated Curriculum System

Clarify the logic of grouping. First, analyze the professional needs. Through research, sort out the needs of each major in the medical professional group. Since each major is different, the demand and employment prospects may vary, and targeted analysis and adjustment are required. Second, consider the knowledge structure and ability cultivation. There are close knowledge connections and ability cultivation relationships among the majors in the medical professional group. Sort out the knowledge structure of each major, and determine the setting of basic courses, professional courses, and the arrangement of practical links. In theory, all majors in the dental medical technology professional group belong to the category of medicine and health. They share the characteristics of connected foundation, similar technical fields, related professional positions, and shared teaching resources. The majors within the group should complement each other's advantages, form a joint force, integrate the common resources of the majors, and share curriculum resources, professional teachers, training bases, etc. Achieving the coordinated development of each major is conducive to the vertical deepening and horizontal expansion of students' professional knowledge under the background of the new medical sciences. The new medical industry requires medical staff to possess comprehensive professional knowledge and skills and be able to adapt to the changing medical environment and diverse job positions. Therefore, higher vocational colleges must keep up with the trend of the times, pay attention to the needs and development trends of society, continuously adjust and improve the setting of their professional groups, and cultivate compound medical talents with adaptability and innovation ability. Higher vocational colleges need to accurately position and develop differentially in the setting of professional groups. Different higher vocational colleges can choose different development directions for professional groups according to their own characteristics and advantages. In the process of constructing the dental professional group, the integration of cutting-edge disciplines, industrial technologies, standards, etc. should be deeply integrated into the curriculum, docking with industry needs to form an integrated teaching content and curriculum syllabus, achieving docking with job requirements, industry standards, and production processes, and accordingly comprehensively adjusting the standards of curriculum objectives, curriculum content, and curriculum evaluation, meeting the professional talent cultivation objectives and graduation requirements, and forming an overall coordinated and integrated curriculum system.

4.2 Reasonably Formulate the Talent Cultivation Plan

Formulating a talent cultivation plan is the key to constructing the medical specialty group in higher vocational colleges. The talent cultivation plan should clarify the cultivation objectives and content for students according to the characteristics and requirements of medical specialties. Specifically, it should focus on combining the learning of theoretical knowledge with the cultivation of practical abilities, emphasize the cultivation of students' practical abilities and innovative awareness, and enable students to possess the ability to solve practical problems and adapt to the development of new technologies. Based on the new situations in the development of various industries, combined with the local economic development and the employment needs of enterprises, set the talent cultivation objectives of the college, establish a new mechanism for adjusting the professional structure and talent cultivation type structure guided by demand, and then formulate corresponding talent cultivation plans. Adopt a "progressive" practical curriculum system and cultivation mode, combine professional skills with professional qualities, and at the same time, through the methods of promoting learning by competitions, promoting teaching by learning, promoting reform by teaching, and promoting construction by reform, conduct a new round of curriculum reform, reconstruct the curriculum teaching system, narrow the gap between school education and market demand, and improve students' employment competitiveness.

4.3 Enriching the Construction of Teaching Resources

In the construction of the medical oral technology specialty group, enriching the construction of teaching resources is the key to improving teaching quality and cultivating high-quality talents. The characteristic curriculum system of the specialty group that "connects courses with positions and integrates courses with certificates" should be continuously optimized, forming a curriculum system framework including modules of humanistic cultivation and quality education, shared courses of the specialty group, core professional skill courses, and innovation and entrepreneurship education courses. Incorporate advanced industrial elements such as new technologies, new skills, new processes, and new norms into teaching standards, optimize curriculum content, and formulate curriculum standards for the specialty group. Refer to the national teaching resource bank construction standards to establish a teaching resource sharing platform. Apply modern information technology to build a school-level shared teaching resource. Centered on learners, improve the functions of the co-construction and sharing platform, respond to the talent cultivation needs of the industry, improve the resource certification standards, expand the resource coverage, improve the multi-agent collaborative model, and jointly build and share a high-level specialty group teaching resource bank by schools and enterprises. Follow the principle of "integrated design, modular courses, and granular resources", and rely on the school's internal teaching platform

to operate the specialty group teaching resources network, complete the construction of the professional teaching resource bank with high quality, and achieve the co-construction and sharing of high-quality resources.

4.4 Optimizing and Innovating the Dual-qualified Teacher Team

Teachers are the foundation of education. To cultivate compound talents, a high-quality, innovative, and "dual-qualified" vocational education teacher team is essential. In the medical field, knowledge and technology are updated rapidly, and the traditional teaching model can no longer meet the needs of students. Therefore, higher vocational colleges should introduce innovative teaching teams. The construction of the dual-qualified teacher team for the medical oral technology professional group can be jointly organized by schools and enterprises to form a "dual-qualified" teacher team, build a cube of production, teaching, and training, and establish a teacher ability development platform. By participating in industrial project guidance and production, teachers can strengthen their understanding of industry forefront technologies, market employment needs, market acceptance standards, project operation processes, etc., and build a high-quality dual-qualified team that masters digital design, analysis, and manufacturing, injecting driving force into the effective development of talent cultivation, discipline construction, innovation and entrepreneurship construction, and social services.

Based on the basic knowledge, software operation basics, and case studies, etc. required for the training tasks, schools and enterprises produce various teaching video courses, which are intelligently matched through technical means and training cases, and the knowledge required by students is intelligently pushed to quickly help students complete the training tasks and improve their practical abilities. The cultivation of medical majors needs to be closely combined with actual work. The college combines the advantages of colleges and enterprises and invites famous teaching teachers and industrial technology experts from universities to train the college teachers. The training content mainly includes technical training and teaching skills in aspects such as digital oral design and CAM intelligent manufacturing. School and enterprise experts "mutually employ and train", and deeply participate in the education and teaching and product production of both sides through offline training and online remote teaching. The two sides jointly carry out professional and curriculum construction, share resources, and the enterprise participates in the whole process of the training process, providing long-term and stable support for students' practical teaching.

4.5 Multi-faceted Construction of Practical Teaching Bases

Practice teaching bases are important places in the construction of higher vocational college major groups to guide students to combine theory with practice. Therefore, it is essential to strengthen the construction of practice teaching bases. Practice teaching bases can simulate real work scenarios, providing students with a real practice environment where they can apply the theoretical knowledge they have learned to actual operations and better adapt to the future work environment. Dental medical technology is a highly practical major, with a large number of operation training contents in the curriculum. The content of the training courses is an important supplement to the theoretical courses and is the consolidation and precursor of the theoretical courses. The teaching of fixed dental prosthesis technology, complete denture technology, and removable dental prosthesis technology Without practical operation, and with the development of the denture industry and the requirements of high-level specialized industry education integration training bases, it is necessary to build practical teaching bases that meet the learning and practice requirements of students. Through sufficient practice, students can keep up with the development of the times and better connect their professional learning with their job positions. Adequate digital practical training can also greatly improve the teaching effectiveness of the course, enhance students' practical ability and comprehensive quality, strengthen their core competitiveness, increase their employment rate, and enhance the influence and reputation of the school, playing an important role in enrollment.

4.6 Construct an Industry-education Integration System with Local Economic Characteristics

Based on local economic development and market demand, a local economic characteristic-based industry-education integration system with "one platform, one base, and one studio" as basic units is constructed and applied to talent cultivation, professional development, enterprise construction, etc., giving full play to professional advantages and characteristics, and ultimately realizing the promotion of local economic culture. The "one platform" plays the role of a comprehensive service platform for the product design major, coordinating elements such as teaching staff, curriculum construction, and curriculum teaching, and making reasonable innovations to meet the macro construction requirements of the "local economic characteristic-based industry-education integration system". The "one base" is to establish a deeply cooperative industry-education integration training base, design center, and school-enterprise alliance, with directional cooperation respectively with the "one studio", enabling all three parties of professional construction, industrial development, and talent cultivation to benefit together, creating a characteristic industry-education integration professional construction model, maximizing the utilization of characteristic majors with limited resources, proceeding from industrial needs, giving full play to the strength of multiple parties, and driving the development of the regional economy and culture. Based on local economic development and market demand, give full play to the advantages and characteristics of the product design major, and play the triple coordination role of "off-campus + on-campus + school-enterprise" to promote the development of industry-education integration construction of the product design major. Adhering to the development concept of "optimizing professional development through industry-education integration, building majors based on regional development, and developing characteristic professional construction", construct a professional characteristic construction model of "off-campus practice teaching base construction + on-campus supporting studio construction + school-enterprise

collaborative education concept and method", with the development idea of "connecting with the industry, collaborating with enterprises, serving employment, and leading entrepreneurship", based in the local area, influencing and driving the surrounding areas, and cultivating compound application-oriented talents suitable for the development of regional economy and culture, with international perspectives, innovative awareness, and entrepreneurial potential.

4.7 Dynamic Monitoring and Regular Evaluation

Dynamic monitoring and regular evaluation are crucial for the development of professional clusters. Dynamic monitoring helps to promptly identify problems and deficiencies, and make timely adjustments and improvements. Regular evaluation, on the other hand, can provide strong support and guarantee for the development of professional clusters. The content of dynamic monitoring should include the monitoring of the implementation of the professional training plan. By understanding the implementation of the professional training plan, the teaching quality and teaching effect of the professional cluster can be evaluated. In addition, the academic performance and employment situation of students are also one of the important contents of dynamic monitoring. By monitoring the academic performance of students, the teaching effect of the professional cluster and the learning situation of students can be understood. At the same time, it is also very important to monitor the employment situation of students. By understanding the employment rate, employment quality and employment industry of students, etc., it can be evaluated whether the training objectives of the professional cluster match the employment needs, and how competitive the professional cluster is in employment. Regular evaluation is a supplement and summary of long-term monitoring. Through regular evaluation, a comprehensive and systematic review and evaluation of the development of the professional cluster can be carried out. The content of regular evaluation includes the teaching quality, academic research level, and construction of the teaching staff of the professional cluster. Through the evaluation of these aspects, we can understand the advantages and disadvantages of the professional cluster, and provide targeted suggestions and improvement measures for the development of the professional cluster.

5. Conclusion

The construction of the medical professional cluster in higher vocational colleges is a complex and long-term process that requires the joint efforts of all parties. By strengthening the construction of teaching resources, teaching staff, practical teaching and supervision, etc., the medical professional cluster in higher vocational colleges can better meet the needs of the new medical science and contribute to the cultivation of excellent medical talents. In the future, the medical professional cluster in higher vocational colleges should cooperate with medical universities, strengthen practical teaching, and cooperate with the industry to further improve the teaching quality of medical majors and the comprehensive quality of students.

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