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Discussion on Talent Cultivation Mode of Wastewater Treatment Technology under the Perspective of Industry-Education Integration

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Abstract: In the current context of environmental protection and sustainable development, there is a growing demand for wastewater treatment technology talents, which mainly stems from the problem of global water shortage and the continuous improvement of environmental protection standards. However, compared with this growth in demand, the supply and cultivation of wastewater treatment technology talents are facing many problems and challenges, such as insufficient practical experience, disconnection between education and industrial demand, and untimely updating of teaching methods and course contents. These problems seriously affect the quality and quantity of wastewater treatment technology talents and hinder the development of environmental protection. This paper discusses the cultivation mode of wastewater treatment technology talents from the perspective of industry-education integration. By analyzing the needs and challenges of wastewater treatment technology talents, it proposes a cultivation mode of wastewater treatment technology talents, which is realized through the strategies of strengthening school-enterprise cooperation, emphasizing hands-on practice and field training, providing flexible learning paths, adaptively updating curricula, and upgrading teachers' quality. This model can help students find a balance between theoretical learning and practical experience, better develop their professional skills, and make positive contributions to the development of the wastewater treatment industry.

Keywords: wastewater treatment technology; personnel training; industry-teaching integration

Introduction

With the development of society and economic progress, environmental protection problems are becoming more and more prominent, and people's attention to environmental protection is increasing. Especially in today's increasingly scarce water resources, the development and popularization of sewage treatment technology have become more important. Sewage treatment technology aims to reduce the damage of sewage to the environment and turn it into reusable resources, to save water, protect water resources, improve the ecological environment, and so on. At present, China's personnel training in this field still faces some challenges, such as the disconnection between education and industrial demand, and the combination of theory and practice is not close enough. Therefore, it is of great significance to find and realize an effective talent cultivation model for wastewater treatment technology to solve this problem. In such a background, the proposal of an industry-education integration model aims to break the traditional education model and better combine education with social and economic development to meet the actual needs of society and industry. It is of practical significance to seek the path of talent cultivation in the field of environmental protection by exploring the talent cultivation mode of wastewater treatment

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technology from the perspective of industry-teaching integration.

1. Brief description of the background of the integration of industry and education

Industry-teaching integration perspective is a new educational perspective, the core of which is industry demand-oriented, to realize the deep combination of school education and the actual industry, so that students can be exposed to the real working environment in their learning, to enhance their practical ability and innovative thinking. Industry-industry integration is an innovative mode of deep combination of education and industry, which originated from the reform of vocational education in developed countries, aiming at solving the problem of disconnection between education and industry, to meet the demand for high-skilled talents in the era of knowledge economy. Under this model, enterprises and schools strengthen cooperation and realize the high matching of teaching content and teaching methods with the actual needs of enterprises by sharing resources. The application of the industry-teaching integration model in China is of great significance for solving the many problems existing in China's vocational education at present, such as the disconnection between the teaching content and the social demand, and the weak practical ability of students (Zou et al., 2022). Especially in the field of wastewater treatment technology, the integration of industry and education can not only cultivate technical talents with professional knowledge and practical experience but also help to promote the development of the industry and achieve the goal of sustainable development.

2. The current situation of sewage treatment technology personnel

2.1 Environmental Protection Engineering Education status

With the increase in population and the rapid development of science and technology, the world is facing problems such as the over-exploitation of natural resources, the emission of pollutants, the global shortage of resources, and ecological deterioration. People have realized the importance of environmental protection, but to solve these problems, not only need to improve their awareness of environmental protection, and take conscious environmental action but also rely on scientific means. The environmental protection engineering program has always been striving to meet these challenges and continues to train professionals to solve environmental problems. In addition to imparting professional knowledge, environmental protection engineering education is also trying its best to cultivate students' environmental awareness, moral consciousness, attitudes, and values, and to guide them to take responsibility for building an ecological civilization. However, there are still some problems in the current professional education of environmental protection engineering, such as the disconnection between the teaching content and the social demand, and the weak practical ability of students. Therefore, the industry-teaching integration model has a broad application prospect here, and it is likely to become an effective means to improve the status quo of professional education in environmental protection engineering in China.

2.2 The demand and importance of sewage treatment technology talents

Sewage treatment technology talents are increasingly in demand in today's society. With the acceleration of industrialization and urbanization, the discharge of industrial and domestic sewage is increasing, and if it cannot be effectively treated, it will cause serious damage to the environment and may affect human health. Therefore, professionals with the technical ability and expertise to treat these effluents are becoming increasingly important. Wastewater treatment technicians also play a key role in solving the problem of water scarcity. Their work is not only limited to wastewater treatment but also includes recycling and reusing the treated water resources, which is especially important for regions with scarce water resources (Wan et al., 2016). At the same time, rising environmental standards require businesses and communities to treat wastewater more

efficiently. The resulting technical demand and environmental protection policy drive the increasing demand for wastewater treatment technology personnel. It can be seen that wastewater treatment technical personnel play a crucial role in maintaining environmental sanitation, safeguarding human health, solving water shortages, and improving environmental standards. Their specialized skills and knowledge provide solutions for dealing with complex sewage problems, so it is crucial to cultivate and attract such talents.

2.3 Problems and challenges in the training of wastewater treatment technology personnel

Although the demand for wastewater treatment technology personnel continues to grow, there are still some problems and challenges in the training process. First, higher education and professional training institutions tend to be concentrated in large cities and developed regions, which makes it difficult for students and staff in some regions to access the necessary education and training resources. Second, there may be a gap between curricula and teaching methods and the needs of actual work. Many education and training programs may be too theoretical and lack practical operation and on-site work experience, which results in trained technical personnel being unable to adapt quickly after entering the workplace. Again, as environmental standards and technologies continue to evolve, education and training programs need to be updated to keep pace. However, this requires a lot of resources and time, which is a challenge for many education and training institutions. Finally, the work of wastewater treatment technicians is often characterized by harsh environments and high work pressure, which may lead to brain drain and increase the difficulty of talent development (Ma et al., 2020). Therefore, solving these problems requires the joint efforts of the education sector, enterprises, and the government. They need to provide more educational resources, improve curricula and teaching methods, update the contents of education and training promptly, as well as improve the working environment and treatment to attract and retain these valuable talents.

3. The realization path of wastewater treatment technology talent training mode under the perspective of industry-education integration

3.1 Strengthening school-enterprise cooperation

The school-enterprise cooperation mode can make the education content closely linked with the actual demand to ensure the practicality and timeliness of the teaching content. Under this model, schools and enterprises should jointly participate in curriculum design, practical training programs, and other links, so that students can better understand and master the skills needed for actual work in the learning process. Enterprises can provide internships and field training opportunities for colleges and universities so that students can participate in the work of wastewater treatment to better understand the combination of theoretical knowledge and practical skills (Battle , 2008). At the same time, schools can also feedback the latest needs of enterprises into the curriculum design and teaching content, so that the training content matches the actual needs. Enterprises can also provide schools with the latest industry trends and technical information to help schools update and optimize their curricula to ensure that the teaching content is cutting-edge. In addition, enterprises and schools can work together on research projects to promote the development of wastewater treatment technology and provide students with opportunities for research and practice. Strengthening school-enterprise cooperation is a way to closely integrate teaching with practical work, which helps to better cultivate wastewater treatment technology talents to meet the needs of the industry.

3.2 Emphasize hands-on practice and field training

The learning of theoretical knowledge is the foundation, but only through practice can we master and apply this knowledge. Therefore, the educational process should provide practical opportunities as much as possible, so that students can understand and master the various technologies of sewage treatment

in the actual operation. On the one hand, the school should set up special laboratories and internship bases to simulate the real working environment, so that students can learn and master the technology in the simulated actual combat. Through the hands-on operation, students can understand the theoretical knowledge more deeply, and at the same time exercise their hands-on ability and problem-solving ability. On the other hand, field training is emphasized. Through school-enterprise cooperation, students have the opportunity to enter enterprises and participate in actual wastewater treatment work, to understand and familiarize themselves with the actual working environment and process. Field training not only provides real operating experience for students to better master the technology but also helps students to understand the industry dynamics and enhances their ability and confidence to cope with the actual work (Bi & Wang, 2021). Emphasizing hands-on practice and field training, combining theoretical learning with practical operation can effectively enhance the professional skills and employment competitiveness of wastewater treatment technical personnel.

3.3 Provide flexible learning paths

The key to meeting the needs of different students is to provide flexible learning paths. In the process of cultivating sewage treatment technology talents, different students may have different learning needs, interests, or time schedules, so it is necessary to provide diversified and flexible learning opportunities. Schools can set up various forms of short-term courses, which are highly targeted and compact, allowing students to quickly understand and master the knowledge and technology of a specific field in a short period and improve their skills (Wei et al., 2022). Meanwhile, the promotion of online learning can provide more learning opportunities for students. Through the network, students can learn anytime and anywhere according to their schedule, breaking the limitations of time and place. Moreover, online learning resources are rich and diverse, which can meet students' different learning needs and improve learning efficiency. In addition, practical training and other practical learning are also very important. This type of learning allows students to deeply understand theoretical knowledge in practical operation, improve their hands-on ability and lay a good foundation for their future work. Therefore, the flexible learning path can not only meet the different learning needs of students but also improve teaching efficiency, which is conducive to improving the quality of the cultivation of wastewater treatment technology talents.

3.4 Adaptive updating curriculum

In the cultivation of wastewater treatment technology talents, updating and adaptively adjusting the curriculum is also crucial. Wastewater treatment technology is a field of continuous development and improvement, new technologies, theories, and methods continue to emerge, and the teaching content should be synchronized with the latest developments in the industry to ensure that the skills and knowledge learned by the students are in line with the current needs of the industry. Updating the curriculum is not just a matter of adding or subtracting content, but also a comprehensive adaptive adjustment of teaching objectives, teaching methods, course structure, and assessment methods. Such adaptive updating should be based on extensive industry research and student feedback to ensure that the curriculum design matches the actual needs. More specifically, the curriculum should focus on the exploration of cutting-edge technologies and emerging issues, so that students can have an understanding and mastery of the latest wastewater treatment technologies. In addition, the curriculum should emphasize the cultivation of practical skills, such as the ability to operate new wastewater treatment equipment and the ability to solve practical problems (Xu & Lu, 2021). Through adaptive updating of the curriculum, we can cultivate wastewater treatment technology talents with both a deep theoretical foundation and a strong practical ability to meet the needs of society and the industry.

3.5 Improve the quality of teachers

Enhancing teacher quality is another key link in

the wastewater treatment technology talent cultivation model under the perspective of industry-education integration. Teachers play a leading and guiding role in this process, and their quality and ability directly affect the learning effect and career development of students. First of all, teachers should have profound professional knowledge and rich practical experience. This requires them to continuously conduct self-learning and research to maintain a keen insight into the latest developments in the field of wastewater treatment technology. At the same time, they should frequently communicate and cooperate with enterprises to understand the needs and dynamics of the industry to bring the latest technologies and applications into the classroom. Secondly, teachers should also have good teaching abilities and methods. They not only need to be good at teaching complex professional knowledge to students concisely and vividly but also need to be able to stimulate students' interest in learning and cultivate their innovative thinking and practical ability (Xu & Lu , 2022). Finally, teachers' professional ethics and sense of responsibility are also very important. They should set a good example for students and guide them to establish correct values and professional views. Improving the quality of teachers can not only improve the quality of teaching but also help to cultivate better talents in wastewater treatment technology.

Conclusion

This paper comprehensively analyzes the demand for wastewater treatment technology talents and the existing training problems and explores possible paths to improve talent training from the perspective of industry-teaching integration. In response to the existing challenges, the importance of school-enterprise cooperation, practical training, providing flexible learning paths, updating adaptive curricula, and upgrading the quality of teachers is emphasized. Among them, university-enterprise cooperation can effectively connect theory and practice, hands-on practice and field training enables students to acquire practical skills in real working environments, flexible learning paths satisfy the learning needs of different students, adaptive updating of curricula ensures that the education content is synchronized with the development of the industry, and upgrading of teachers' quality can ensure the quality of education. In the future, it is necessary to further study how to achieve these goals more effectively to continuously improve the quality of training talents in wastewater treatment technology. With the development of technology and changes in the industry, it is necessary to continuously update and adjust this training model to meet new situations and challenges.

Conflict of Interest

The authors declare that they have no conflicts of interest to this work.

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