



Research on Integrated Talent Training in Vocational Education

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Abstract. With policy incentives, the modern vocational education system in China has been basically established, and the talent training system of industry and education integration has shown initial results. Following, the Integrated Pattern of talent training and education should focus on digital education infrastructure, digital course resources, and digital evaluation standards. It is indisputable that we should take the practical path of integrating industry, education, science, and city, even more, exploit new domains and tracks to promote the digital education and build a lifelong learning society.

Keywords: Modern vocational education system; lifelong learning; multi-channel growth

1 Introduction

The *Vocational Education Law of the People's Republic of China* revised in 2022, clearly proposed the establishment of a modern vocational education system that "integrates vocational education with general education, effectively connects vocational education at different levels, and serves lifelong learning for all." On the basis of "consolidating the positioning of vocational education types and designing an integrated vocational education talent training system." It is further proposed to "establish and improve a gradient vocational education and training system with multiple forms of connection, multi-channel growth, and sustainable development, promote the coordinated development and mutual integration of vocational education." [1].

In term of development scale, China has established the world's largest vocational education system. In 2022, vocational schools enrolled 5.4661 million students, which is 1.8 times higher than ten years ago [2]. Especially in the past three years, the enrollment of higher vocational education has continuously exceeded new highs, the ratio of enrollment in vocational education to general higher education has steadily in-

creased in Fig.1, and the type positioning and unique charm of vocational education have been highlighted.

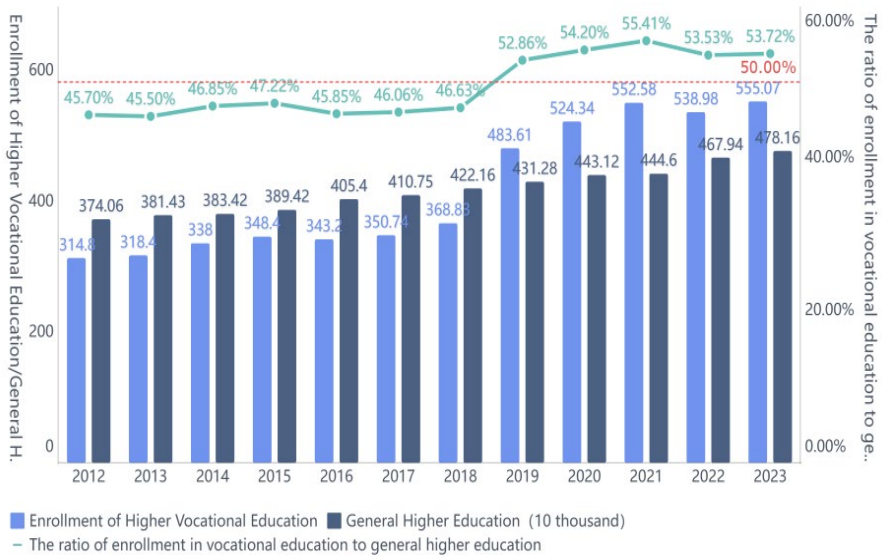


Fig. 1. the ratio of enrollment in vocational education to general higher education in 2012-2023

To achieve integration between vocational education and general education urgently requires the integrated design of a technical and skilled talent training system, and the strengthening of the infiltration and integration of general education and vocational education in different learning stages. We should develop the plan of upgrade education, by encouraging exchange course programs and shared credit between secondary and higher vocational education institutions. We should also carry out educational advancement plans, through Advanced Placement courses, mutual credit recognition, constructing body of knowledge, strengthening knowledge integration, and filling knowledge gaps. We aim to provide students with solid technical skills and qualified cultural foundations for run-through personal training[3].

2 Research on New Way of Integrated Talent Development

Vocational education plays a leading, fundamental, and global role in the development of the national economy and society. There is an urgent need to establish a pathway for further education, which not only connects academic education such as undergraduate and master's degrees, but also integrates nonacademic education such as academic certificates and vocational skill level certificates, truly achieving collaborative innovation among vocational education, higher education, and continuing education.

2.1 Developing Digital Education Infrastructure

Infrastructure is the first step to develop digital education. New generation information technologies such as cloud computing, artificial intelligence, digital twins, and virtual simulation, are integrated via the internet. Digital infrastructure expands learning spaces, transfer learning resources, customize learning activities, and enjoy timely learning evaluation and feedback services, truly achieving personalized learning. Digital education can achieve greater education coverage and more balanced access to educational opportunities.

In the process of building digital education infrastructure, colleges must promise to construct a standardized system. The Ministry of Education issued the "Digital Campus Standards for Vocational Colleges" and the "Digital Campus Construction Standards for Higher Education Institutions (Trial)" in 2020 and 2021, respectively, to accelerate the standardized application of new generation information and communication technology in the field of education[4]. Shanghai has provided a good sample. In August 2021, the Ministry of Education approved Shanghai as a pilot area for educational digital transformation. Then Digital Transformation Standards Committee released a series of standard specifications such as the Shanghai Education Data Management Measures, the School Digital Base Requirements and Construction Standards, the Education Management Basic Data.

According to “China Smart Education Bluebook 2022”, more than 70% of vocational schools is covered with WLAN, and the percentage of schools with cyber learning space is 84.97%, showed in table 1. At the end of December 2022, the Smart Education of China, Platform for Vocational Education provided 32000 online courses and 13117 professional teaching resource libraries. So to speak, digital education infrastructure has basically established, and great contribute to the talent cultivation.

Table 1. Indicators of China Smart Education

Index	Data Dimension	Indicator
1	Percentage of vocational schools with a broadband connection	98.99%
2	Percentage of vocational schools with WLANs network coverage	73.49%
3	Percentage of classrooms with multimedia device	61.68%
4	Coverage rate of majors with major-related resources provided by SEC-PVE(Smart Education of China, Platform for Vocational Education)	67.47%
5	Percentage of vocational schools with cyber learning space	84.97%
6	Proportion of teachers with sufficient digital literacy	54.25%
7	Percentage of active users in SEC-PVE	68.87%
8	Effective utilization rate of resources on the SEC-PVE	63.61%

2.2 Constructing Body of Knowledge System

Vocational education should continuously adapt to the requirements of the Party and the country, guide education modernization with digital education support, and accelerate the implementation of the national education digital strategy. The key to digital education reform is to build high-quality digital education public resources, build a sound knowledge system, and enrich the supply of large-scale resources.

Firstly, it is necessary to systematic design curricula for talent develop. The modern vocational education system, including secondary vocational education, higher vocational education, application-oriented, undergraduate education, and professional master, provides a path for lifelong learning and growth[5].

Secondly, we should focus on core courses construction following the Plan 101, which is a projects leading by Minister of Education of China. It aims for recommending a batch of high level courses and textbooks. Vocational education should focuses on the development of new quality productive forces, greatly developing digital skills, offering core courses such as cloud computing technology application, electronic information technology, computer application technology, integrated media technology, e-commerce, modern logistics, marketing management, industrial robot application and maintenance. It will be helpful for development of digital economy.

2.3 Exploring Integration of Industry, Education, Science and City

Talent cultivation, scientific research, and social services are important responsibilities of higher education. Vocational education should provide strategic support for the high-quality development of industries. The Majors design should keep close with the regional characteristic industries, and the curriculum design should be in line with job competency requirements. Here we take a major of Electronic Information Engineering Technology as an example in Fig.2.

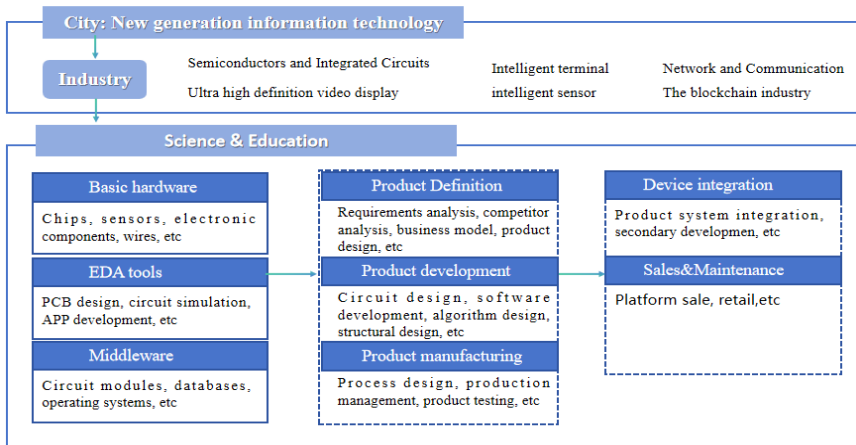


Fig. 2. An Example of Major Design

The college located in a city renowned for the new generation information technology industry. So the development of the major should follow the industry upgrade, especially advantageous industries, such as semiconductors and integrated circuits, ultra high definition video display, intelligent terminal, and so on. Then the courses are designed according to the job skill requirement.

On the other hand, the organized scientific research will feedback teaching, and empower the talent cultivation. In December 2022, the General Office of the Communist Party of China and the State Council issued the "Opinions on Deepening the Reform of Modern Vocational Education System Construction", proposing to build a municipal industry education consortium and an industry industry industry education integration community, so as to further promote the idea of integration of industry and education into brick and mortar. The key to making the platform a "booster" for the integration of industry, education, science and city is to establish an effective cooperation mechanism. Realize the new sharing of information, talent, technology, and infrastructure, and smooth the virtuous cycle of education, technology, and talent.

At the same time, engineering practice runs through the entire process of teaching in colleges. We should develop new technologies, such as artificial intelligence, digital twins, virtual simulation, and metaverse, which can break out the constrain of time and space. More importantly, they can reform traditional practice method[6]. Web crawler software can assist in data collection; Big data technology can efficiently annotate, classify, and organize information; Artificial intelligence technology can assist in identifying and extracting key information; Cloud computing can achieve information collaboration and sharing; Digital twins can be used for scene reconstruction; Virtual simulation can create new spaces. While digital technology assists practical teaching, it can also promote the improvement of scientific research level. In addition, the data space provides convenient collaboration and communication across disciplines, fields, schools, and regions.

2.4 Designing Multi-dimensional Evaluation System Supported With AI

Evaluation is a key link in monitoring the quality of talent cultivation. Integrated talent cultivation must firmly grasp the evaluation lever and establish an evaluation system that promotes student development. Firstly, we need to break the single evaluation mechanism that only focuses on academic performance. The traditional curriculum evaluation mainly takes exams as the main form, and the exam content and grading standards have strong teacher subjectivity and one-sided evaluation. The most important characteristic of vocational education is its professionalism, with the goal of cultivating technical application ability. Therefore, more attention should be paid to the cultivation of students' behavioral ability, discovering and developing their multifaceted potential, helping students self-awareness, building confidence, and evaluation should play a positive guiding role. The most important thing is to adopt diverse and multidimensional evaluation methods, focus on process evaluation, value developmental evaluation, innovate behavioral evaluation, and comprehensively and truthfully

reflect the individual characteristics of the evaluation object. The establishment of an evaluation system should focus on the following aspects[7].

Evaluation criteria are the first step to implement. The formulation of standards should adhere to "vocational property" and promote the integration of literacy standards and vocational skills standards[8]. Schools and teachers are the main body of teaching, and students are the evaluation objects. They are an important part of the virtuous cycle of mutual learning and teaching. Enterprises and research institutions are the key to introducing new technologies, processes, and standards into the education process. Therefore, it is necessary to collaborate with schools, teachers, students, industry and business experts to jointly participate in the formulation of standards.

3 Conclusion

The whole process of talent cultivation in vocational education is more like a industrialization-oriented practice. We always stay focused on cultivating technical and skilled talents with composite capabilities. Vocational colleges should adhere to the "student-centered" principle, making good use of innovation centers, engineering training centers, and industrial technology research institute, and such on platforms. To achieve the goal of targeted-training of engineering talents, we should insist on the way of integrating science, industry and education, binding education with skills competition, professional qualification certificates.

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