Practice of Digital Transformation in Vocational College

Yanping Lu[1,a*], Guang Dong[2,b], Zhuo Ba[3,c], Xiaofeng Lin[4,d]

[1]School of Artificial Intelligence, Beijing Institute of Economics and Management, Beijing, 100102, China
[2] Henan Mechanical and Electrical Vocational College, Zhengzhou, Henan, 451192, China
[3]Shenzhen Vocational and Technical University, Shenzhen, Guangdong, 518055, China
[4]Shenzhen Institute of Information Technology, Shenzhen, Guangdong, 518172, China

[a*]yanpinglu@biem.edu.cn, [b]dong630@126.com
[c]15543005455@126.com, [d]lxfeng_74@163.com

Abstract. The modern vocational education system in China has been basically established, and the integration between industry and education have achieved initial success. To meet the digital economic development, the models of talent training in vocational education should focus on digital ability, which is the key competitiveness for the strategic emerging industries and industries of the future. According to the Chinese policy of "Opinions on Deepening the Construction and Reform of the Modern Vocational Education System", we should take the practical path of integrating industry, education, science, and city, deeply digging fields of Digital infrastructure, digital courses resources, and digital evaluation standards. summing up cases and experience that would be replicable and scalable, to speed up the digital transformation of college.

Keywords: Digital Ability; Quality education; Engineering training; Vocational education; Modern vocational education system.

1 Introduction

Digital technology has been a great influence on global economy, infiltrated into all aspects of society of politics, culture and ecological civilization. Digitization in field of education is an important breakthrough for China to open up new way for high quality educational development, own technology advantages, and achieve competitiveness[1].

In December 2022, the General Office of the Communist Party and the State Council published the “Opinions on Deepening the Construction and Reform of the Modern Vocational Education System”. It proposed to develop professional core courses and practical ability projects in twelve key industries and fields in the part of strategic tasks, including the new generation information technology industry, high-end computer numerical control machine tools and robots, high-end instruments, aerospace equipment, ship and ocean engineering equipment, advanced rail transit equipment, energy electronics, energy-saving and new energy vehicles, power equipment, agricultural

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machinery equipment, new materials, bio-pharmaceuticals, and high-performance medical devices.

In May 2023, the Ministry of Finance and the Ministry of Education announced the budget for the 2023 Modern Vocational Education Quality Improvement Plan. Vocational education is putted into an important position. It is clear to support the development and increase funding towards vocational education. in June, the National Development and Reform Commission and eight other departments announced "the Implementation Plan for Empowering and Enhancing the Integration of Industry and Education in Vocational Education (2023-2025)". And in July, the Ministry of Education implemented "the strategic project of comprehensive reform of higher education". The key words are reform and innovation.

All efforts aim to point out the development direction for vocational education. Vocational education is a fundamental, but important support for Chinese-style modernization. It is necessary to promote the digital transformation in colleges, so as to vigorously cultivate innovative technical talents owning digital literacy, and to greatly improve the scientific and technological innovation ability of higher education[2].

The paper focuses on practice of digital transformation in vocational colleges based on research. To meet the standards of future talent, we should insist on the way of integrating industry, education, science, and city, Here we introduces some success cases aiming to form replicable and scalable experience, and to speed up the digital transformation of college.

2 Path of Digital Transformation in Higher Vocational Education

Digitization of education is not only an inevitable choice for vocational education to respond to the development and challenges of the digital era, but also an urgent requirement for the deep integration of the entire system of vocational education with digital technology.

2.1 From Knowledge-based to Intelligence-based Teaching

In recent years, digital technologies such as internet of things, artificial intelligence, big data and cloud computing are employed by colleges. It pushes the vocational education out of the difficult position, solving the problem of less attractive classroom, outdated content, monotonous teaching method, repeated testing form, and so on in some degree. Intelligence-based teaching is helpful to achieve interesting, useful and effective teaching and activating students' main-body consciousness.

Firstly, we should develop digital education infrastructure. For example, Hunan Automotive Engineering Vocational College has cooperated with well-known enterprises of Huawei. They jointly equipped with intelligent components in schoolroom and workshop, designed scenario-based classrooms, community-style classrooms, and appointment-based classrooms to meet the various needs of autonomous and interactive learning[3]. Shanghai Business Accounting School is another successful case.

Absorbing "the Belt and Road" experiences, they sponsored a innovation camp of modern business education. And based on it, they developed a cross-border e-commerce operation cloud platform integrating with teaching, exhibition, competition, mass entrepreneurship and innovation. The school and e-commerce industry association have jointly built a "cloud platform" for education and training[4].

Secondly, we should expand the space for smart education. For example, the National Intelligent Education Platform for Vocational Education of China is well designed, and it has gradually formed a public service system of national, provincial, district, county, university platform. Another example, Tianjin Vocational University is building a "Cloud Learning City" and a Virtual Simulation Public Training Center to assist in personalized customization, intelligent push, and precise supply of intelligent classrooms[5]. These new form of learning space provide good support for students' development.

2.2 From Information-based to Cloud-deployed Management

Smart management system employs information technologies, such as big data and artificial intelligence to deal with complex data processing. In recent years, intelligent information systems have covered many aspects of management, such as teaching plans, teaching resources, teaching activities, teaching quality supervision, teaching administrative services, etc. With technological advantages of network interconnection, information exchange, and data sharing, they promote the transformation from traditional experience based management models to scientific data analysis based management models.

Data management is the foundation of smart system. With the modern educational management concepts, vocational colleges insist on adjust the architectures of management platform, especially in response to problems such as fragmentation and discretion, aiming for effectively run through teaching process and management process. For example, Shanxi Vocational and Technical College of Industry has built six information modules to deal with real-time data and achieve the aggregation, sharing, and analysis of data, from several perspectives of school, major, course, teacher and student. They have innovated a closed-loop management model for quality diagnosis and improvement[6].

Intelligent services are the objection of smart system. In response to the limitations of traditional teaching services such as solidification and lack of humanity, we utilize big data technology to analysis the behavior characters of teacher and student while teaching and learning. The process can contribute to student's portals. It is helpful to achieve effective push of personalized teaching services. At last, the colleges effectively promote the transition from "user searching for services" to "service searching for users". For example, Anhui Vocational College of Commerce has developed school data standards, integrated all business systems, optimized service processes, applied digital technology and digital thinking to the entire process of teaching management services, and supported scientific decision-making, precise management, and convenient services[7]. Changzhou Information Vocational and Technical College insists on student-centered and demand-oriented talent training, developing modules such as

online preparatory courses, online teaching, and graduation tracking, constructing platforms such as online preparatory courses, online teaching, online services, and graduate tracking, and constructing a comprehensive service system from pre-enrollment to post graduation[8].

3 Good Practices of College in Digital Transformation

The digital practice of colleges has achieved significant success in innovating talent cultivation models, promoting the integration between industry and education, and enhancing digital governance capabilities. we should sum up cases and experience that would be replicable and scalable, to speed up the digital transformation of college.

3.1 Shenzhen Polytechnic University: Placing Majors at the Forefront of the Industry

Shenzhen Polytechnic University relies on the development of industries in the Pearl River Delta, targeting strategic emerging industries, advanced manufacturing, and modern service industries as key regional development industries[9]. It has built 15 characteristic industry colleges, with each industry college joining forces with a leading industry enterprise. Fully leverage the characteristics and advantages of vocational education that integrates industry and education, benchmark against the "latest, highest, and best", and achieve "co construction, co integration, and sharing" in ideological and political education, standard formulation, resource development, team building, technical research, certificate development, entrepreneurship and innovation education, international cooperation, and other aspects. Connect the teaching process with the production process, and the employment quality of students significantly improves. On average, the proportion of students employed in the Fortune Global 500 or industry leading enterprises reaches 16% per year. Here we take a major of Electronic Information Engineering Technology as an example in figure 1.

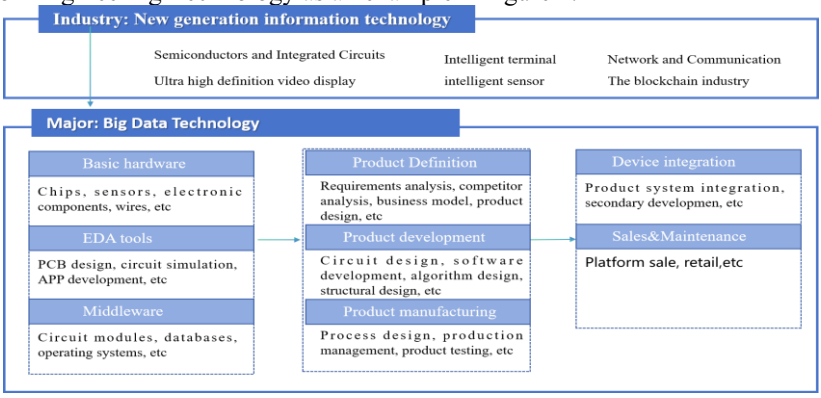

Fig. 1. Digital Skills Planning for Major of Electronic Information Engineering Technology

Firstly, the university establishes a flexible credit course system for job positions. The school has constructed a diverse, flexible, and dynamic credit system curriculum system based on the principles of ability orientation, curriculum grouping, and adaptation to individuality. Based on the basic course grouping of "public courses+professional group platform courses+professional courses+professional direction courses+professional expansion courses", the curriculum system is reconstructed for majors and positions. Among them, public courses are used to strengthen the cultivation of general vocational abilities, professional group platform courses are used to cultivate the adaptability of professional groups to job positions, professional courses are used to build core vocational abilities, professional direction courses are focused on subdivided work fields and composite ability requirements for vocational positions, and expanded courses are used to meet the personalized development of students. Especially in the internship and graduation design stages, students are encouraged to recognize achievements and exchange credits through various forms such as physical design, research reports, entrepreneurial copy, and business plans.

Secondly, the university establishes a collaborative talent training model between schools and enterprises that integrates courses and certificates. The core of the school enterprise cooperation model is the integration and symbiosis of professional courses and enterprise certification. In the formulation of the plan, emphasis is placed on the alignment between talent cultivation and industrial demand. Always integrate the cultivation requirements of "professional skills+professional ethics" throughout the entire process of classroom, practical training, and internship. In terms of teaching implementation, emphasis should be placed on integrating curriculum development with certificate standards. Close cooperation between schools and enterprises to continuously optimize the allocation of teaching resources, adhere to close coordination with industrial upgrading and technological change, follow the updates of enterprise certification systems, continuously adjust courses dynamically, and achieve precise education.

3.2 Henan Mechanical and Electrical Vocational College: Building Majors in Field

Henan Mechanical and Electrical Vocational College has established 24 secondary colleges in the industrial field in accordance with the requirements of professional integration with industries, course integration with positions, and teaching process integration with production processes[10]. It has established a talent training system guided by professional abilities and promoted the dual delivery of "engineering projects+talents". At present, the school has successfully provided technical and training services to 397 enterprises, overcome more than 500 technical difficulties, and won 5 provincial science and technology progress awards and 315 invention patents; 61 technological transformations have been achieved, resulting in a cumulative economic benefit of 1.14 billion yuan. Talent cultivation is in short supply, and students are pre-ordered by multiple companies before graduation. Here we take a Major of Big Data Technology as an example in figure 2.

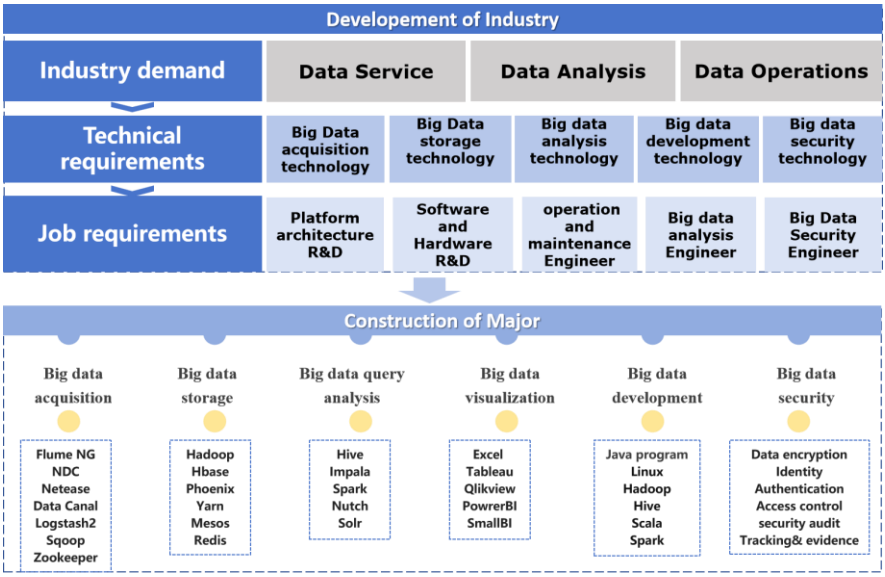

Fig. 2. Digital Skills Planning for Major of Big Data Technology

Firstly, major's teaching and management is in actual field of project implementation. the college design the major on the existing (online) field. The school and cooperative enterprises jointly build a community with a shared future for the school, enterprise, and science, and build majors on the industry chain. Taking the cognition of enterprise production scenarios as the first professional course, students will be assigned to the enterprise production team to learn design and manufacturing technology on the manufacturing front line; Learn installation and construction techniques on the engineering front line, and management and maintenance techniques on the operation and maintenance front line. At present, the school has deep cooperation with 9 industrial parks and 130 units, including the Huojia Industrial Agglomeration Zone, to jointly build 24 industrial colleges. Schools and enterprises jointly develop talent training programs, practice the on-site (offline) model, rely on the technological, product, and service advantages of industry enterprises, and continuously improve the quality and industrial adaptability of talent training while conducting scientific research and transforming achievements.

Secondly, work-simulation courses are greatly developed. The school adheres to the principle of "sending education to enterprises" and relocates classrooms to industrial parks. In the real scenario of "research and development, pilot transformation, incubation and entrepreneurship, promotion of production, installation and commissioning, and operation and maintenance services", students are encouraged to fully participate in completing real projects and continuously convert real enterprise cases into course resources. At present, the school enterprise cooperation has formed a new development pattern of positive interaction. The school has built 38 technology research and development institutions, 40 maker workshops, 14 master studios, 30000 square meters of

provincial-level incubators, incubated 127 key research projects including carbon neutrality and alumina (national torch project), and achieved targeted talent cultivation.

4 Conclusion

With the rapid development of digital technology, the conventional pedagogy needs a digital version. From paper-based books to electronic resources, from classroom teaching to virtual simulation , digital technology is not only widely applied in various aspects of learning and teaching, but greatly impacts on students' learning methods and learning outcomes.

"2030 Agenda for Sustainable Development" adopted by The United Nations proposes that the goal of sustainable development in education is to ensure inclusive and equitable quality education, and promote lifelong learning opportunities for all. Student-centered education indicates teachers should be collaborators and facilitators to help students' development. Therefore, we need to promote the overall digital reform of universities.

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