Research on Digital Transformation of Talent Cultivation Mode for Mechanical Majors

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Abstract. Machinery industry is a basic and strategic industry for the development of national economy, and it is an important industry for the country to participate in the global economic development and reflect the comprehensive strength of the country. With the deepening of the digital and international transformation of enterprises around the world, new requirements have been put forward for the cultivation of mechanical professionals. The article analyses the demand and theoretical basis of digital transformation for mechanical professional talents, and puts forward the talent cultivation mode of constructing professional clusters, ideological and political education system, digital ability cultivation curriculum system, digital teaching environment and teaching team, which provides reference for comprehensively improving the quality of mechanical professional talents cultivation and improving the satisfaction of students and society.

Keywords: digital transformation; mechanical major; talent training model

1 Introduction

With the development of cloud computing, artificial intelligence, blockchain, big data, 5G and other digital technologies, the digital transformation of various industries has accelerated dramatically.According to the Global Digital Economy White Paper (2023) released by China, the size of the digital economy value-added in the 51 countries measured will be $41.4 trillion in 2022, a nominal growth of 7.4% year-on-year, accounting for 46.1% of GDP [1]. The digital talent has become a key factor in the quality and upgrading of enterprises, and in 2020, 55% of EU enterprises reflected difficulties in filling the gap of ICT professionals. The Final Report released by the U.S. National Security Council on Artificial Intelligence in 2021 concluded that the U.S. is ill-prepared for the training of talents in the field of artificial intelligence and the cultivation of digital literacy for the whole population, which will adversely affect industrial competition and national security [2]. China's Industrial Digital Talent Research and Development Report (2023) points out that the current overall shortage of digital talents is around 25 to 30 million, and the shortage of digital talents has become an important factor restricting the development of the digital economy [3]. Higher education and the economy are closely associated, and the digital economy requires a large number of innovative digital talents, so the digital transformation of higher education is imperative.

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The machinery industry is the core industry of the national industrial system, which is responsible for providing technical equipment to all sectors of the national economy, and is an important symbol for measuring the degree of industrialization of a country and the comprehensive strength of the national economy [4]. All countries put the development of machinery industry into the first place. Mechanical specialities bear the heavy responsibility of cultivating talents in the mechanical industry, and the level of its talent cultivation is closely related to the development and progress of the country. In the context of digital transformation, the traditional talent training model has not been able to meet the transformation of enterprises on the need for talent, so the change of mechanical professional talent training mode, help to cultivate adapt to the needs of the times and meet the requirements of the transformation and upgrading of the industry and enterprises of the innovative, composite talents.

2 Digital transformation demand for mechanical professionals

Digital transformation of the manufacturing industry refers to the integration of digital technology into all aspects of the design, production, management, sales and service of manufacturing enterprises, and can be based on the analysis and mining of data generated in all aspects of the control, monitoring, testing, forecasting and other production and business activities, to fundamentally improve the performance of enterprises [5]. Digital talent needs to be able to integrate and construct knowledge, acquire hands-on skills in technology remixing, and be able to creatively solve complex technical problems [6]. Digital talents in the field of machinery manufacturing need to have the original field of expertise, but also need to have a digital mindset, with the ability to integrate knowledge and technology, master the use of digital tools skills, digital means to promote business development, as well as the ability to break through the original thinking of cross-border search for solutions to the innovative ability and ecological synergy awareness. Siemens put forward the "Π-type Digital Talent Competency Model" for more than ten core "digital job maps" in industrial manufacturing enterprises （as shown in figure 1） , pointing out that the competencies of digital talents in industrial manufacturing enterprises should include three aspects: vertical industry knowledge, digital technology and comprehensive management and leadership capabilities. Management and leadership capabilities. In addition, Siemens also emphasizes that excellent digital talents need to possess three core competencies: cross-team collaboration, rapid learning and strategic thinking. Therefore, the digital transformation of mechanical majors should focus on training students in digital thinking and the ability to integrate engineering knowledge and digital tools, as well as the use of digital tools around the problem of independent learning, management of engineering problems, and then have the ability to raise real engineering problems from complex engineering phenomena and solve engineering problems.

3 Theoretical basis and thoughts of digital transformation of talent training mode of mechanical majors

Erik Stolterman and Anna Croon Fors consider digital transformation as the changes caused by digital technology in all aspects of human life [7]. In the field of education, digital transformation refers to the process of comprehensive reform and innovation of the educational

process, educational resources, educational management and other aspects through the use of modern information technology means, in order to improve the quality of education, promote educational equity, and cultivate innovative talents. Zhu Zhiting analyzed the mechanism of digital transformation of education from the perspective of change factor theory, he believes that social evolution, ecosystem changes, changes in the learning and teaching environment, etc. lead to the emergence of internal and external needs and external factors for the transformation and development of the education system, and ultimately promote the digital Darwinism of education transformation, pedagogical creation, education system resilience construction, education ecological butterfly, to the core of the human-centered intelligence of the wisdom of education[8], as shown in figure 2.

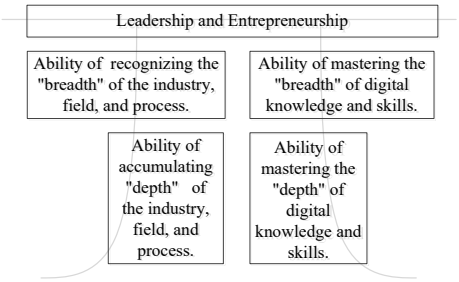

Fig. 1. Siemens' Digital Talent Competency Model

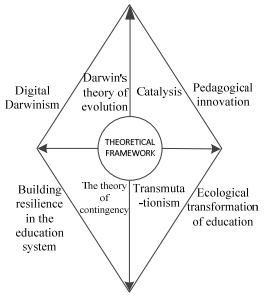

Fig. 2. Variant theories of digital transformation in education [8]

The profession is the basic unit of talent training in universities, and the digital technology-driven industrial transformation has caused changes in the social demand for talents, which requires the digital transformation of the profession. The characteristics of the digital transformation of professions are reflected in the shift of professional talent training from specificity to connectivity, the professional field from closure to openness, professional schooling from independence to synergy, and professional certification from rigidity to flexibility. For this reason, the digital transformation of professions should be centered on the goal of providing society with suitable professionals and supporting students' personality development, and should be carried out in the areas of talent training programs, teaching methods, teaching management, professional teaching resources and the teaching environment [9]. The idea of reform is shown in Figure 3.

4 Measures for digital transformation of talent cultivation models for mechanical majors

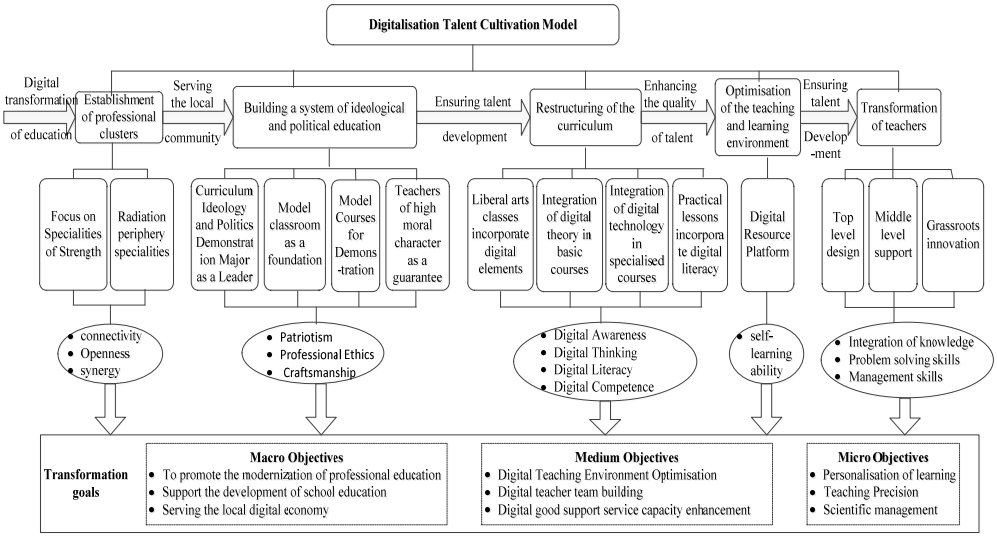

Fig.3. Thoughts of digital transformation of talent training mode of mechanical majors

4.1 Building professional clusters and improving local service capacity

The advanced form of the evolution of digital industry development is the digital industry cluster [10], which is the root and power source of the development of the digital economy, a new engine to promote the high-quality development of the economy, and a strategic high point to reshape the international competitiveness. Industrial clusters are the accelerators of future regional economic growth by improving production efficiency and promoting innovation among enterprises. Undergraduate colleges and universities professional settings and discipline development planning attaches great importance to the development of social and economic development in line with the digital industry clusters need new talents, the training of talents can not be separated from the development of higher education, so mechanical specialties should be based on the regional counterparts of the industrial clusters planning and construction of professional clusters, give full play to the advantages of the main body of the school, the formation of mismatched competition, complement each other's strengths of a good layout of the specialties. There are 19 mechanical majors in China's Catalogue of Undergraduate Majors in General Institutions of Higher Education (2022). Schools need to create intelligent manufacturing clusters according to their geographical characteristics, focusing on the advantageous majors and radiating the peripheral majors, so as to achieve the function of playing the leading role of the advantageous majors to drive the development of other majors, and at the same time to achieve the function of radiating and expanding through the supportive majors to promote the cross-fertilization of majors and to cultivate talents for the intelligent manufacturing industry clusters.

4.2 Constructing a system of ideological and political education to improve the quality of talent cultivation

The fundamental task of universities is to establish morality and nurture talent for the country. In the digital age, students' access to information and resources has become more convenient and diverse. Certain information can have an impact on the formation of a student's values, world view and outlook on life, and can lead to biases and misperceptions. The rapid and abundant availability of information also affects students' ability to think deeply and analyze. Fragmented information and skimming habits affect students' critical thinking and can bias their understanding of social and political issues. All these have put forward new requirements for ideological and political work in colleges and universities, and the traditional ideological and political courses have been unable to bear the burden of ideological and political education, and only by constructing an all-embracing, all-encompassing and all-encompassing system of educating people can we cultivate qualified talents for the digital era.

Mechanical students are the core force of national industrial development and the implementation of major national intelligent manufacturing strategies, which not only require students to have the ability to design, innovate and apply engineering technology, but also require students to have the correct patriotic sentiment, professional conduct, humanistic values and craftsmanship. In order to realize the purpose of comprehensive education, a four-level and multi-dimensional system of ideological and political education has been constructed. The four levels refer to the construction of a system of cultivating people in the field of ideology and politics which is led by the construction of a model major in curriculum ideology and politics, based on a model classroom in curriculum ideology and politics, exemplified by a model course in curriculum ideology and politics and guaranteed by teachers of moral and artistic excellence. Multi-dimensional refers to the combination of online and offline, inside and outside the classroom, through the combination of course resources, teaching methods, assessment methods, network platforms, practical teaching and other aspects of the course Civics, so that the course Civics education three-dimensional surrounded by the students, and really let ideology and politics education into the ears, the brain and the heart.

4.3 Build a digital competence training curriculum system to enhance students' digital literacy

The core of digital transformation in education is to enhance students' digital literacy and develop digital talents. Digital literacy, from low to high, should include digital tool use, digital thinking and digital innovation skills. The national quality standard for mechanical majors in China stipulates that the curriculum system includes general education courses, discipline-based courses, professional courses and practical sessions, so to enhance students' digital literacy we must open up all the links, so that the cultivation of digital literacy can be carried out throughout the entire curriculum system. The main measure is to incorporate digital elements such as “Internet +”and “Smart +” into the Liberal Studies curriculum, so as to enable students to build up their initial digital awareness. Digital design and information technology courses are offered in the subject foundation courses to develop students' ability to use digital tools. Professional courses set up for digital, intelligent manufacturing design, processing, testing, assembly and other corresponding course system, and the use of the latest digital theory, technology and application to guide the course teaching to form a holistic link, the virtual and real combination of teaching content, guiding students to form a digital, intelligent manufacturing production

model of the system view, and cultivate students' digital thinking. The practical sessions make use of virtual simulation technology, digital twin technology, modern industrial colleges, and comprehensive practical training platforms to strengthen students' digital literacy as well as their ability to comprehensively apply digital technology for innovation.

4.4 Create a digital teaching environment and promote the digital transformation of talent training

Digital expands the teaching space. the traditional entity physical teaching space can not meet the demand, learners need to learn anytime, anywhere, on-demand learning opportunities, need to have independent learning, lifelong learning conditions. The creation of a digital teaching environment can provide students with inter-temporal learning environments, can provide students with personalized, diversified, intelligent teaching and learning activities. Establishment of a digital resource sharing platform, with the creation of high-quality courses, network courses as the core, the integration of teaching resources to build an electronic lesson plan library, internship training case library, teaching videos, related pictures, physical models, test question bank and other components of the teaching resource library, to provide students with a stable performance, powerful independent learning platform. To promote active, collaborative, research-based and self-directed learning and to develop an open and efficient digital teaching model.

4.5 Creating digital teaching teams to safeguard digital transformation

The digital transformation of teaching and learning presents new challenges and opportunities for teachers [11], who not only need to be digitally literate but also have the expertise to integrate digital technologies into teaching and learning [12]. Teachers should be good at using digital thinking, identify the growth rules of innovative talents based on big data and artificial intelligence, promote students' independent learning, and shift the teaching method from "knowledge transfer" to "research and exploration". The building of digital teaching teams needs to be cascaded from school leaders to frontline teachers. School leaders must be committed to supporting, advocating and implementing the enhancement of digital teaching and learning skills for all teachers. Middle-level cadres should continuously promote the cultivation and motivation of teachers' digital competence, which can be carried out by the way of "from point to area, and gradually radiating". Firstly, develop outstanding backbone teachers as the implementers of digital teaching reform, and then drive all teachers to teach digitally through competitions and demonstration classes to promote the construction of digital campuses. Frontline teachers should realize that digital competence is the core competitive ability necessary for teachers in the future digital society, and they should take the initiative to explore the forms of combining digital technology and professional knowledge in the teaching process, and they should make good use of MOOC, micro-courses, virtual simulation, AI and other digital technologies to innovate the teaching process, so as to achieve the real integration of digital technology with the teaching rules and the characteristics of the students of this profession.

5 Conclusions

The digitization of industries has placed higher demands on the ability of practitioners to use information technology, thus forcing the education system to undergo digital transformation and upgrading as well. Specialization is the main framework for cultivating first-class talents. By building intelligent manufacturing professional clusters, ideological and political education system, digital curriculum system, teaching environment and faculty, students majoring in machinery can be guided to learn independently, pursue innovation, and master the inter-disciplinary and inter-disciplinary knowledge, abilities and qualities required in the digital era.

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