The Transformation of Vocational Education in the Context of Deep Learning Theory: Actual Dilemma and Practical Path

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Abstract. With the global industrial digital transformation and upgrading, the replacement with automation eliminates labor-intensive positions such as assembly line operations. The 20th National Congress of the Communist Party of China put forward a new direction of "Integration of Science and Education", emphasizing the need for high-quality technical skills to help national technological innovation. But at present, there are some real dilemmas in vocational education, such as shallow teaching and learning, priority of efficiency and instrumental rationality, a lack of students' innovative and holistic problem-solving abilities, and a discontinuity in the development of sustainable career pathways. In order to cultivate innovative talents who can flexibly cope with the current complex situation and future challenges under "Industry 4.0", this paper takes deep learning theory as the guiding ideology and technical knowledge as the basis to explore the teaching practice path in vocational education. Based on deep learning theory, it puts forward four feasible paths. That is to create a multi-modal embodied "exploratory" learning work field, to establish learning activities to cultivate innovative overall problem-solving ability, to construct the network system of generative technology knowledge, and to let educational instrumentality return to the lifelong development of human beings. The conclusion of this paper is that taking problems as the driving axis while integrating deep learning into the practical logic of teaching and learning to realize the sustainable development of students' career.

Keywords: technical knowledge, critical thinking, deep learning theory, embodied cognition theory.

1 Introduction

At present, China is in a society led by digital technology represented by artificial intelligence, big data, etc. The rapid development of digital technology has brought subversive influence to all aspects of economy and society, and at the same time, it also calls for all-round profound changes in vocational education, which is most closely related to industrial development[1]. In the digital era, technical skills person-

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nel are bound to face the risk of being abandoned by the labor market if they only master simple operational skills, and only by actively embracing comprehensive professional literacy can they seize the strategic opportunities of new technological change. Therefore, the talents cultivated by modern vocational colleges must have professional skills, critical thinking, creativity, teamwork and communication and other comprehensive vocational abilities needed to quickly adapt to emerging technologies. The nature of work in the digital age not only increases the technical skill requirements of workers, but also enhances the abilities that contribute to the sustainable development of individuals and societies, such as high cognitive abilities, interpersonal coordination, and self-development.

However, in current teaching practice, most of them only imitate operational actions, that is, only know "how to do" vocational knowledge. The "reason" of doing so, that is, the ontology and principle of the technology, is lacking in in-depth thinking. Due to the lack of multi-dimensional and multi-angle integrability, the dependence on the scene is generated, which becomes mechanized and context-bound learning. In addition, under the guidance of the employment-oriented concept, vocational education is biased towards the skills training closely related to the position, which leads to the lack of development of composite professional qualities such as top-level design, operation management, communication and coordination, and creativity, and the obvious lack of vocational mobility and sustainable development ability. Under the current teaching mode, it has been difficult to adapt to the current and future complex workplace situation full of uncertainty to rely solely on mechanical imitation of skilled personnel, skilled training, and rote knowledge memory learning system[2]. In order to adapt to the transformation of talent structure in the 21st century, the deep learning theory has come into being, which can effectively cope with the needs of talent training caused by the transformation of industrial structure and technological development. It is helpful to improve the comprehensive professional quality of technical talents.

2 Implications of Deep Learning

Higher vocational education needs to awaken the minds of students, stimulate the deep continuous drive and self-efficacy, and cultivate students' "experience" and "subjective" cognitive structures with silence and explicit words, so as to achieve innovative thinking and innovative skills in solving problems as a whole. The so-called tacit knowledge is implicit knowledge, which is the result of non-verbal intellectual activities that we know but cannot be fully stated and cannot be clearly expressed through language, text, charts or symbols, and has the characteristics of tacit, irrational and situational[3]. Digging into real workplace situations is the best way for mutism techniques to be proven and perfected. Sound knowledge acquisition methods and independent "fishing" skills are essential lifelong learning abilities in the digital age.

Therefore, the higher vocational education under the care of deep learning theory should be driven by problems and renew the core quality of compound vocational

education carried by students themselves. "Knowledge is power" does not mean that the more knowledge teachers teach students, the better, but emphasizes that teachers should guide students to acquire meaningful knowledge in a way of sound independent and critical thinking. In the 1970s, American scholars Ference Marton and Roger Saljo proposed the concept of "learning hierarchy", pointing out that "deep learning" is the active processing, construction and transfer of knowledge on the basis of understanding. Thinking critically belongs to the higher level of cognition and thinking[4]. Other scholars have different definitions of "deep learning", but there is a basic consensus on the definition of "knowledge-people-practice-future". The rapidly iterated and upgraded technologies and knowledge require the emergence of a large number of highly skilled talents with the core qualities of composite professions, which are deep in people's "hearts", integrated into reality and accessible to the future.

3 Realistic Dilemma of Higher Vocational Education Reform

Based on embodied cognition theory, active innovation and tacit knowledge can not be separated from the multimodal embodied learning work field. Global industries undergoing digital transformation and upgrading are bound to eliminate labor-intensive jobs. As the most direct interface of talent training, teaching quality has a decisive influence on the effect of talent training.

3.1 Excessive Instrumentalization in Teaching Has Become the Norm

The digital transformation of education is a process of gradual evolution. The digital development of each educational institution not only inherits the history of the application of digital technology to education and teaching, but also faces the future of digital transformation[5]. The essence of technology is hidden in the technology practice in the context of related work. Only by tapping the multiple potential of human as the subject can we explore the principle and value of technology itself, so as to truly realize the technological innovation under the background of continuous iteration and upgrading. To achieve this goal, it is necessary to correct the tendency of excessive instrumentalization in contemporary higher vocational teaching, attach importance to the subject status and multiple intelligence of people, and fully activate the deep internal motivation of individuals. Today, in the era of Industry 4.0, the deep link between informatization and industrialization, the rapid change of technology and social trends need high-quality technical and technical talents with sustainable literacy for the development of a whole career.Focusing solely on students' first employability is a short-sighted behavior, and sufficient attention should be paid to both first employment and continuous employment.

3.2 Shallow Teaching Pervades the Classroom of Higher Vocational Colleges

The current learners often just stay in the shallow learning state of mechanical imitation of operational actions. Deep teaching aims to cultivate high-quality technical

skills, while deep learning is the rational practice of realizing the full breadth, depth and relevance of knowledge by using problem situations. Only with deep understanding of knowledge can we creatively solve complex problems as a whole. Knowledge can only be truly powerful if it is connected with social practice. It can only solve the well-structured problems in simple practice situations but not the poorly structured problems in complex workplaces. Its essence lies in the lack of action ability of composite professions. High-quality technical talents from the perspective of deep learning should be good at transforming the problem context into comprehensive professional literacy, and deep learning is precisely using the problem context as a bridge to transform comprehensive professional literacy[6].

3.3 There is a Gap in the Sustainability of Whole-Career Development

In contemporary education, teachers should be transformed from mere knowledge disseminators to "co-scholars" of students. Contemporary college students quickly absorb new technology and information, showing a strong spirit of inquiry and insatiable thirst for knowledge. Faced with the new situation and changes brought about by scientific and technological progress, educators must take the initiative to adapt to these changes and quickly adjust their teaching methods. They must identify the role and positioning of AI technologies in educational activities, while at the same time recognizing more critically the multifaceted role they themselves embody, thereby facilitating the process of mutual empowerment. Educators should consciously cultivate a co-learning relationship, take advantage of the advantages provided by artificial intelligence technology, actively explore the basic principles that guide teaching practice, and innovate new teaching methods. Digital transformation is long-term, tortuous and uncertain[7]. As an "education center", how to promote the safe and reliable integration of artificial intelligence and education, solve teaching challenges, innovate teaching methods, optimize education results, and improve the overall quality are the key issues that must be faced.

4 Analysis of Teaching Paths Under Guidance of Deep Learning Thorry

Deep learning is a profound embodiment of comprehensive learning. It is a kind of advanced learning, which aims to cultivate comprehensive core literacy and reflective critical thinking ability. Within this educational ecosystem, a strong and comprehensive curriculum system has been established that combines scientific inquiry with practical applications.

4.1 Stimulate Intrinsic Motivation in the Field of Inquiry

This ecological situation should be to build an ecosystem of artificial intelligence and mixed reality technology. This kind of ecosystem should be closest to the real work scene of the enterprise, so the actual typical work tasks of the enterprise should be

reconstructed into a multi-dimensional embodied visual space, and through a variety of virtual and real interactions, learners can deeply participate in the appropriate "work situation" with psychological and embodied experience. It is an important task for college personnel training to cultivate students' innovative ability of independent learning. The emergence of artificial intelligence technology has brought new opportunities for the shaping of college students' autonomous learning ability, enriched learning resources, improved learning efficiency, stimulated learning motivation, deepened innovative thinking, enhanced learning interest, and enhanced cognitive ability.

PISA defines problem solving ability as the ability of individuals to use cognitive processes to deal with and solve problems in real and interdisciplinary contexts[8], which means that problem solving requires the flexible integration of multi-disciplines, multi-cognition and multi-contexts. Knowledge integration is a higher-order cognitive ability that needs to be continuously promoted based on lower-order cognitive thinking. In fragmented teaching, the interaction of technical knowledge is weakened, the complete work action process is disassembled, and the comprehensive professional ability to solve problems is divided into a single-dimensional ability with weak correlation. In the process of solving problems, students need to integrate knowledge independently, which is highly unstable risk. In particular, it will push lower grade students towards binding learning that depends on vocational context [9].

The ecosystem of the workplace is "inquiry" as the core, and the process of personally experiencing the validation of technical knowledge can help learners liberate their own drive in the active exploration, so as to multiply the sense of value, and this sense of value can help them concentrate on the workplace situation. Educators can use AI technology to dynamically track the action process data of individual students, teach students according to their aptitude, create characteristics, participate deeply, enlightening the heart, and moisten things silently. Teachers should guide students to create more flexible time and customized modes for their independent learning with the blessing of AI technology, so that their learning is more flexible in time and more personalized in space. It facilitates the holistic construction and communication of connections and meanings between knowledge domains, technology, self-identity, others, society as a whole, and future aspirations.

4.2 Conceptual Reconstruction and Professional Integration

How can a novice solve a problem like a practice expert? What's the difference between an expert and a novice? This is reflected in the correlation between problem solving and knowledge construction, both of which are positively facilitative. The knowledge structure storage unit of practical experts is not fragmented knowledge like that of novices, but a structured network system formed by the internalization of technical knowledge after individual initiative rationality and technical practice. There are not only series and parallel plane structures, but more network vertical structures with high correlation degree and multiple links. Structured knowledge system not only expands the capacity of working memory, but also increases the sensi-

tivity of knowledge extraction in the process of problem solving, and the degree of "collision" and "activation" between knowledge is higher, and the vitality of innovation is stronger (see Figure 1). In the era of rapid changes in digital technology, complex problems solved by high-quality technical talents are usually poorly structured problems in dynamic changes, which are different from well-structured problems solved according to the situational transfer of old and new problems. Poorly structured problems belong to high-pass migration in different contexts, and the knowledge field involves horizontal and vertical conceptual systems, mixed with cross-changing cases. Fragmented and obsolete knowledge structures are often ineffective, requiring learners to build a more flexible and generative network system of technical knowledge structures, and be able to integrate and reconstruct the knowledge system according to changing problem situations [10].

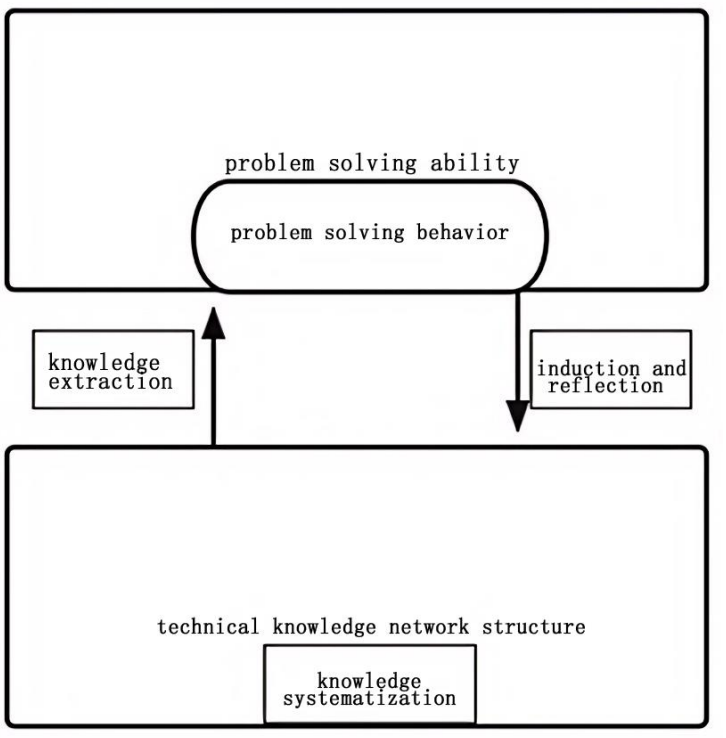

Fig. 1. Relationship between problem solving ability and technical knowledge network structure

The level of technology depends on the level of problem solving ability in the workplace, and the depth of individual learning can be measured by high-quality problem context. Knowledge integration is a kind of higher-order cognitive ability that needs to be continuously improved on the basis of lower-order cognitive thinking, and deep learning is a profound embodiment of comprehensive learning. The devel-

opment of complex problem solving skills depends on participation in extremely challenging problems or problem vectors, and certain challenges are contagious and powerful catalysts that trigger cognitive conflict among learners, foster positive emotions and initiative, enhance the coding of professional action capabilities, and promote deep learning. Educators must design a demanding set of tasks characterized by coherence and stability in the sources, nature, methods and structure of knowledge and technology, while ensuring relevance and hierarchy in the various areas of work.

In the contemporary era, especially with the advent of large-scale language models in AI, teaching methods are moving toward a triad framework known as "TSAI (Teacher-Student-Artificlial Intelligence, Teacher-Student-AI)". This shift has fundamentally altered the dynamics of interactions between knowledge, educators, learners, and AI, with AI technology moving beyond its role as a mere assistant and many AI platforms now intricately integrated into all aspects of student learning and cognitive development. Vocational education should be closely combined with market demand and employment. However, the current vocational education does not pay attention to the cultivation of vocational transferability, and the one-sided education under the guidance of instrumental rationality leads to the lack of individual career and sustainable development ability.

5 Conclusion

The integration of AI technology into university education and teaching is both an opportunity and a challenge. At present, with the integration of AI technology into all aspects of universities, opportunities and challenges coexist naturally, and "AI+ HI (Artificial Intelligence + Human Intelligence)", brings people a different visual experience. The learning of technical skills requires innovative thinking and tacit knowledge, which requires educators to construct multimodal embodied situations with deep immersion experience. Teaching practices based on deep learning should reflect the problem orientation of "science and education integration" and the sustainable development of the whole career, and establish an environment conducive to critical reflection in the deep learning education ecosystem that emphasizes competency-based lifelong learning. An effective instructional assessment should have career potential at all stages, from novice to operational specialist, as its guiding principle, and such an assessment aims to prepare learners to constantly update their technical knowledge systems to cope with a rapidly changing work environment.

It is necessary for teachers and students in colleges and universities to pay close attention to the development trend of education digitalization, deeply analyze the evolution law, practice picture and presentation path of education and teaching under the role of artificial intelligence, make full use of and give full play to the positive role of artificial intelligence technology in college education and talent training, and educate students in a way that is easy for students to accept and understand by means of value guidance, self-shaping and comprehensive evaluation. Help the digital and intelligent transformation of university teaching. The concept and development of deep learning is consistent with the core competencies necessary to succeed in a

knowledge-driven economy, and in an inquisity-based teaching ecosystem, it will stimulate efforts aimed at cultivating high-quality technical talent in China, while contributing to the ecological transformation of the technology field and the harmonious coexistence of humans, nature and society. On the basis of the above discussion, we come to the conclusion that positioning the problem as the central axis, deep learning must be seamlessly integrated into the practical framework of teaching and learning to facilitate the sustainable development of students' careers.

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References

1. Yang Yuqian, Xu Xiaorong. Spatial expression and order construction of digital transformation of Vocational education[J]. Education and Career, 2024(9):13.
2. Huang Guiqin. The path to promote the modernization of Chinese vocational education under the concept of Humanism[J]. Vocational and Technical Education, 2024(21):53.
3. Michael Polanyi. Personal knowledge[M]. Guiyang: Guizhou People's Publishing House, 2000:140.
4. Yang Xianmin. Open up a new situation of comprehensive digital transformation of education[N]. China Education Daily, 2022- 04.07 (2).
5. Zhang S, Yang Qian. Digital technology capability, business model innovation and firm performance[J]. Science and Technology Management Research, 2021(10) : 144-151. (in Chinese)
6. WANG Chunhui, Zhang Mian Hao. The transition of vocational education under the consideration of Deep Learning Theory[J]. Dilemma and Practice Path, 2023(9):50.
7. Huang Ronghuai, Yang Junfeng. Connotation and implementation path of Education digital transformation[N]. China Education Journal, 2022-04-06(4).
8. OECD2003. The PISA2003 Assessment Frame work -Mathematics,Reading, Scienceand Problem Solving Knowledge and Skills[EB/OL].http://www. pisa.oecd.org.
9. GRAHAM MCPHAIL. The search for deep learning: a curriculum coherence model[J]. Journal of curriculum studies,2021,53(4): 420-434.
10. SPIRO, RAND J. Knowledge acquisition for application: Cognitive flexibility and transfer in complex content domains.[J].Executive control processes in reading, 1987:177-199.