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Transformation of Higher Vocational Classroom Teaching from the Perspective of "Industry 4.0"

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ABSTRACT

The progression of "Industry 4.0" has engendered substantial generational evolutions in the requirements for talents. In the absence of "Education 4.0", the realization of "Industry 4.0" remains unfeasible. The transformation of higher vocational education constitutes a pivotal juncture in the continuous propulsion of the industrialization process. Against the backdrop of "Industry 4.0", researchers concentrate their attention on the classroom instruction within China's higher vocational education. Their objective is to probe into the trajectory of transformation, the focal concerns of classroom instruction, and the means of effectuating such transformations. Researchers maintain that classroom instruction in China's higher vocational education, being an essential arena for talent cultivation, ought to take the emotional experiences within the classroom, the transformation of teaching paradigms, the development of innovative education, and the cultivation of innovative thinking as its guiding orientations. Through "bottom-up" and "inside-out" endogenous transformations, the closed-loop of higher vocational classroom instruction should be disrupted. The goals and directions of talent cultivation should be adjusted dynamically, with equal emphasis placed on classroom instruction and practical applications. Actively, the realization of the strategic objective of "Made in China 2025" should be facilitated to enhance the universal literacy.

Key words: Industry 4.0, Made in China 2025, Vocational Education, Teaching Transformation, Literacy

INTRODUCTION

In April 2013, at the Hannover Messe, Germany released the "Recommendations for implementing the 'Industry 4.0' Strategy". In December of the same year, Germany released the "Industry 4.0" Standardization Roadmap at its Electrical, Electronic and Information Technology Association. The aim was to promote the fourth industrial revolution mainly featuring intelligent manufacturing in the context of the big data era, and take it as an important breakthrough point. With the suggestions and promotion from all parties in Germany, "Industry 4.0" has been elevated to a national strategy of Germany (Deng et al., 2017).

Currently, a new round of scientific and technological revolution and industrial transformation is taking place. The in-depth integration of information technology and manufacturing industry is reshaping the global industrial division of labor pattern. "Made in China 2025" released by the State Council, People's Republic of China (PRC) shows that China is in the middle stage of the industrialization process. Although the scale of China's manufacturing industry has ranked first in the world, overall, the manufacturing industry is large but not strong. The independent innovation ability in some fields is relatively weak, and there is still a certain gap compared with developed countries in Europe and America. The major international changes and China's economic development transformation have formed a historical intersection. At the same time, China's manufacturing industry faces the severe challenges of "two-way squeezing" from developed countries and other developing countries. Under the new situation, only by actively meeting the challenges, strengthening overall planning, and highlighting innovation-driven development can the strategic task of transforming China's manufacturing from large-scale to powerful be completed.

In March 2014, China and Germany jointly issued the "China-Germany Action Plan for Cooperation", announcing the establishment of China-Germany "Industry 4.0" dialogue and cooperation (Weng, 2017). Driven by the "Industry 4.0" strategy, China, which is at a crucial moment of industrial transformation and upgrading, proposed to implement the "Made in China 2025" strategy in May 2015. Its goal is to promote a fundamental transformation of China from a large manufacturing country to a powerful manufacturing country. The implementation of the "Made in China 2025" strategic plan is inseparable from the cultivation and promotion

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of manufacturing talents, and even more inseparable from high-level vocational education (Zhou, 2017). Therefore, situated within the context of "Industry 4.0", researchers direct their focus intently towards the classroom instruction in higher vocational education in China. The overarching objective is to conduct an in-depth exploration into the trajectory of transformation for classroom teaching, the pivotal concerns therein, and the strategies and approaches to actualize the transformation of classroom teaching to enhance the universal literacy.

THE EVOLUTION OF TALENT DEMANDS IN THE ERA

With the development and transformation of the industrialization process, from the "mechanized 1.0" era, the "electrified 2.0" era, to the "automated 3.0" era, and then to the ongoing "intelligent Industry 4.0" era, the production and organizational methods of enterprises and factories have also undergone tremendous evolution. In the process of promoting "Industry 4.0", Western developed countries have planned and developed in terms of four core elements: infrastructure construction, industry standards, talent supply, and industrial organization, among which "talent supply" is an important part of the entire process. The requirements for practitioners in different industrial stages are also different, and there are even huge differences in some aspects.

In the "mechanized 1.0" era, the factory system began to emerge. However, during this period, individual workshops, household handicrafts, and single-piece and small-batch production were still the main production and organizational methods. Each practitioner was engaged in all types of work without clear division of labor. The quality of practitioners determined the production efficiency and quality of products, and practitioners possessed most of the vocational abilities in the industrial production chain.

In the "electrified 2.0" era, assembly-line production began to become the main method of this period. Each practitioner had a clear division of labor. The production organization was divided into detailed segments and strict hierarchies in two dimensions: labor content (horizontal direction) and labor management (vertical direction). Practitioners only needed to have simple basic production knowledge and mechanical single-type operation skills (Shi, 2017).

In the "automated 3.0" era, the production mode shifted towards "customization" and service-oriented manufacturing, forming refined, small-batch, and modular production. The integrity of labor content was restored to a certain extent, and higher requirements were placed on practitioners in multiple dimensions such as decision-making ability, collaboration ability, problem-solving ability, and learning ability.

In the "intelligent Industry 4.0" era based on the Internet and information technology, the "human-machine" relationship has begun to undergo profound changes. Characteristics such as unitization, distribution, personalized customization, intelligent production, and interconnected manufacturing will gradually become the mainstream production models of this stage. With the advancement of the "intelligent Industry 4.0" stage, the requirements for practitioners have also shifted in different dimensions. For example, higher requirements will be placed on dimensions such as the optimization and control of the production process, the diagnosis and maintenance of the production system, and the decision-making and adjustment of the production plan. Only by continuously becoming knowledge-based, learning-oriented, and creative individuals can practitioners meet the needs of labor positions in this stage.

"Industry 4.0" is not only a "technological revolution" but also a "human revolution" and, more importantly, an educational revolution. The core lies in whether it can guide and shape a benign collaborative development model of two-way promotion, where technology serves education and education nurtures society (Chen and Liu, 2016). In the future, the integration of education and economic and social development will be closer. The modern education system with concepts such as the cultivation of innovation ability, the all-round development of people, and lifelong learning will become more prominent. The People's Republic of China (PRC)'s "Thirteenth Five-Year Plan for the Development of National Education" also pointed out that it is necessary to focus on enhancing students' core literacy, technical and skill levels, and sustainable development capabilities, fully promote the in-depth integration of information technology and education and teaching, encourage teachers to use information technology to improve teaching levels, innovate teaching models, and strengthen classroom teaching, and strengthen the cultivation of reserve talents for great craftsmen.

REALISTIC PROBLEMS IN THE ADVANCEMENT OF MADE IN CHINA 2025

The vocational education field in Germany believes that "without 'Education 4.0', there will be no 'Industry 4.0'", and there is even "no 'Industry 4.0' supported without 'Education 4.0'". The reason for this view is that the production and lifestyle characterized by the Internet of Things, intelligence, and digitalization triggered by "Industry 4.0" has formed a pattern of interconnection between people and things. At the same time, other industries are also developing towards the "4.0" state, and thus "Vocational Education 4.0" will also become the new direction of vocational education reform (Zhao, 2017).

Since the reform and opening-up, although remarkable achievements have been made in China's education development and reform, objectively speaking, it still fails to meet the requirements of the all-round development of people and economic and social development. Especially, vocational education remains a short-board in the development of the education system. There is a lack of high-degree of fit between talent cultivation and social development. The collaborative development systems such as the integration of science and education and the integration of industry and education have not yet been formed, and the cultivation of students' innovation ability is insufficient.

Firstly, influenced by the traditional education culture, domestic higher vocational colleges have insufficient attraction to excellent students. People have certain biases towards vocational education in attitude. The industrial stage in the

future advancement will rely on high-tech and information means, while the quality of students will restrict the quality of talent cultivation. The fundamental reason lies in the imperfect vocational education cultivation system. Many students have certain requirements for academic qualifications, and the upward channels for talent cultivation in vocational education are relatively blocked. Whether the future vocational education cultivation system can be fully upgraded will be one of the key issues affecting the advancement of the "Made in China 2025" strategy. Secondly, the positioning of talent cultivation in vocational education is not clear enough, and there is a large lag between the teaching content and curriculum settings and social needs. Another unavoidable problem is the shortage of "dual-qualified" teachers. At the same time, Chinese manufacturing is still in the stage of parallel development of "Industry 2.0" and "Industry 3.0" (Fang and Liu, 2017). These are also the realistic problems that must be rationally and deeply faced in the process of promoting the "Made in China 2025" strategy.

THE DIRECTION POINTS OF THE REALISTIC TRANSFORMATION OF CLASSROOM TEACHING IN HIGHER VOCATIONAL EDUCATION

With the continuous advancement of the industrial stage, new era requirements for the quality of talents have emerged. Classroom teaching is one of the important fields for cultivating talents in higher vocational education, and the quality of its teaching effect seriously affects the quality of talent cultivation. At present, there are many objective and realistic problems in higher vocational classroom teaching. Taking the 16-level mechanical manufacturing class of Guizhou Communication Polytechnic where the author teaches as an example, it was learned from a teacher-student discussion in the new semester that most of the students come from rural areas and have a relatively weak basic knowledge; about 70% of the students do not have a clear positioning for their future careers; about 50% of the students are not very interested in their majors, but most students still have high expectations for the study of professional courses. Based on various objective problems, transforming the existing classroom teaching and seeking the direction points of transformation will be the primary breakthrough point for improving the teaching quality.

Paying Attention to Classroom Emotional Experience

There are multiple criteria for evaluating the quality of a classroom, such as the diversification of teaching forms and effective teacher-student interaction. Besides enabling students to acquire knowledge in class, the most important thing is the students' emotional experience and stimulation in the classroom. Zhang Zhiyong mentioned in the article "Education Far from People is Education Losing Its Soul" that education that only focuses on knowledge imparting and only pursues interests is education that tears and strangles human nature. From the perspective of the goal demands of the new curriculum reform, education has gradually begun to pay attention to the achievement of emotional attitudes and values. However, due to factors such as the examination-oriented education system, in the actual education form, educators often pay more attention to the achievement of the knowledge-goal dimension, while paying less attention to the achievement of the emotional attitude and value dimension, or even ignoring it. As Professor Ye Lan said, the prominent manifestation of the limitations of teaching thinking at the present stage is to limit the classroom teaching goals to the development of students' cognitive abilities. Education should pay more attention to the active development of students and the life journey and life experience shared by teachers and students.

As an important field carrying the ideal expectations of life development, it is of great significance for students to examine classroom emotional experience in teaching practice, and then optimize and enrich it, and finally move closer to the ideal classroom. Whether teachers can center on the development of students and fully respect them will be the key point affecting students' classroom emotional experience. For example, many students like a course because they have a good emotional experience with a certain teacher. Due to the influence of teaching systems and other factors, compared with middle-school teachers, the common time between university teachers (including those in higher vocational colleges) and students mostly exists only in the classroom. Some students have psychological factors such as lack of confidence or even inferiority. Besides the intervention of psychological teachers, if classroom teachers can deeply pay attention to these emotional experiences of students, abandon formalism, return to the essence of education, demonstrate the humanistic care of education, and stimulate students' confidence, it will have a huge positive impact on the physical and mental health and career development of students.

Paying Attention to Classroom Teaching Modes

Edgar Dale, an American scholar and learning expert, put forward the Learning Pyramid Theory, which shows in numerical form the differences in the average retention rates of learning content by learners after a certain period of time when different learning methods are adopted. The current teaching models mostly remain at the passive-learning stage, such as the lecture-based mode. In a single passive teaching mode like the lecture-based one, students only learn passively. The interaction between teachers and students is weak, and the interaction among students is even less. Over time, this will only dampen students' enthusiasm and initiative in learning. Students have few opportunities to exercise their practical and creative abilities, and it is simply impossible to achieve the talent-cultivation goals of higher vocational education (Huang, 2013). There are always individual differences among students. Classroom teaching must pay attention to the imbalance in students' development, deeply study the applicable objects and contents of different teaching methods and models, and adopt the optimal teaching methods. Based on the Learning Pyramid Theory, the author puts forward an architecture diagram for the transformation of classroom

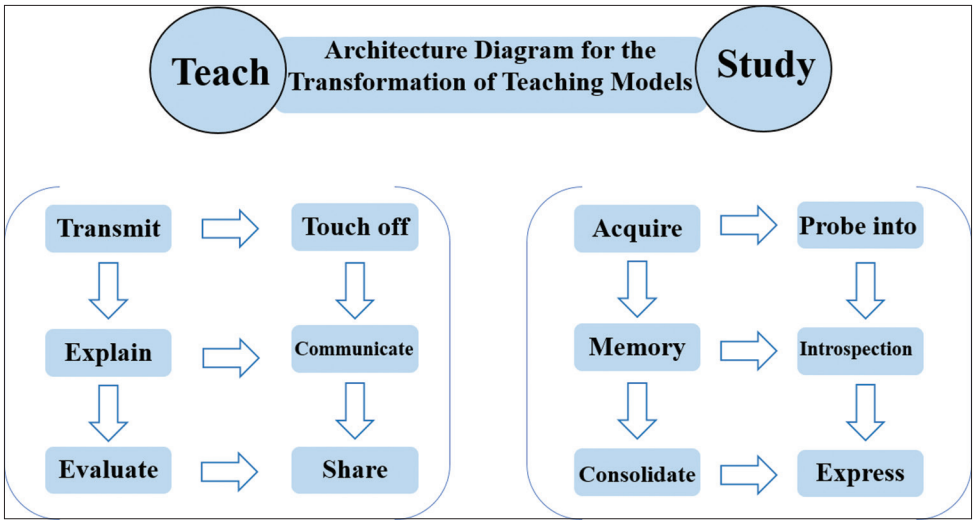

Figure 1. Architecture diagram for the transformation of teaching models

teaching models, as shown in Figure 1. Under this architecture, it is expected to explore and transform the existing higher-vocational classroom teaching models.

Paying Attention to Innovative Education and Cultivate Innovative Thinking

"Made in China 2025" has significantly increased the requirements for the innovation and diversification of practitioners. To achieve the leapfrog development of vocational education, the talent-cultivation goals and directions must be dynamically adjusted. Currently, the main form of innovation and entrepreneurship education in higher vocational colleges is the innovation and entrepreneurship space. As for innovative education, there is a large gap between integrating innovative consciousness, innovative thinking, innovative methods, etc. into the usual education process and the goal expectations to be achieved. The existing teaching forms lack the transmission and grasp of the living soul of the knowledge core, the history of knowledge evolution, and the ideas at the "philosophy of science" level. Eventually, this leads to the elimination of the cultivation of innovative qualities in aspects such as academic evaluation and talent values. At present, it is urgent to improve the effectiveness of innovative education (Li, 2017).

The main restrictive factor for the development of China's manufacturing industry is the lack of innovation ability. In the process of promoting "Made in China 2025", innovation will be the core of the development of China's manufacturing industry. Innovation comes from innovative talents. Vocational education must shoulder the important task of cultivating innovative and entrepreneurial talents. Classroom teaching must focus on strengthening the cultivation and teaching of students' innovative thinking, rationally integrate professional-course education and innovative education, strengthen the shaping of students' independent thinking and innovative spirit, and cultivate innovative and entrepreneurial talents who can adapt to the development of the times (Chen and Zhang, 2017).

Breaking the Closed Circle of Classroom Teaching

With the acceleration of the informatization process, higher vocational classroom teaching will break the traditional closed circle and exist in a dynamic, interactive, constructive, and open form. The informatized classroom teaching environment can provide an interactive, shared, and diversified teaching and learning platform for teachers and students. Using informatization means to create a situational teaching environment can stimulate students' enthusiasm for the active construction of learning. The rapid development of information technology has provided more and higher-level technical support for higher vocational classroom teaching. The introduction of modern technical means into the classroom has brought more external information to the classroom. Teachers can carry out teaching in the form of tasks, projects, etc. on the premise of providing students with resource platforms and information-retrieval channels, and guide students to explore independently. Training and practice are important links in higher vocational education and also important ways to cultivate high-skilled applied talents. At present, there are still certain gaps in teaching forms and contents in this link compared with the real needs of enterprises. To enhance the adaptability and pertinence of talent cultivation, it is possible to explore introducing models such as imitating the real production environment of enterprises and combining virtual factories and virtual experiments with training teaching into higher vocational classroom teaching.

The attributes of higher vocational education determine that its classroom teaching cannot only rely on the utilization and creation of explicit environmental elements but also should give play to the role of implicit environmental elements in classroom teaching. Overlap diverse classroom environmental elements dynamically. For example, explore the implicit elements in the institutional environment of technological upgrading and industrial evolution. Guided by improving students' core literacy, explore educational contents, educational methods, and broaden educational channels from explicit and implicit environments to cultivate comprehensive skilled talents for the new era (Zhu and Zhu, 2017).

CONCLUSION

The continuous development of "Industry 4.0" not only promotes the transformation and upgrading of the industry and the changes in social production methods but also requires practitioners to transform in terms of behavior patterns and thinking modes. Facing the challenges of transformation and upgrading from all aspects, higher vocational education should take this as an opportunity and actively take effective measures to implement a "bottom-up" and "inside-out" endogenous transformation. It should make full use of classroom teaching to promote the transformation of teaching and learning methods, and even the transformation of the higher vocational education culture, so as to truly achieve the goal of transforming the talent cultivation in higher vocational education from knowledge-based and skill-based to application-based and innovation-based (Lin, 2017).

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