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The Evolution of Compound Talents Training in Ordinary Colleges and Universities under the Background of Digital Economy: Take the Engineering Management Major of Putian University as an Example

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Abstract: This research use the methods of qualitative comparison and quantitative analysis, analyzes the evolution of the talent training curriculum structure, curriculum content, training objectives and the effectiveness of talent training .The data comes from the engineering management major of the School of Civil Engineering, Putian University in the past six years. The study found: the curriculum structure of compound talents cultivation in ordinary universities should reduce theory and increase practice, course content goes from traditional to modern, the goal of talent training is to abandon roughness and become more refined, and the effectiveness of talent training keeps pace with the times. The evolution of talent cultivation in ordinary universities is consistent with economic-social development and industry talent demand. Research proves that university teachers pay attention to the frontier of scientific research, while at the same time, attention should be paid to the direction of social and economic development. Only by adjusting the teaching content in time, constantly improving ourselves, and advancing with the times, can we cultivate compound talents that meet the needs of social development.

1. Introduction

With the rapid development of China's digital economy, the scale of digital economy is constantly expanding [1]. From 2014 to 2021, the scale of China's digital economy soared from 16.2 trillion to 45.5 trillion, and its share in GDP increased from 26.1% to 39.8% [2]. The scale of China's digital economy and its proportion in GDP are shown in Figure 1.

The wave of digital economy has swept all sectors of society. It has stimulated the transformation of industrial structure and talent demand in all walks of life. Demand exceeds supply in the digital talent market [3-4]. The construction industry is no exception [5-6]. With the development of the digital age, great changes have taken place in China's architectural style. Construction job recruitment also changes [7-8]. As the cradle of social talent cultivation, the talent training system of colleges and universities changes with the market demand. The evolution of talent training system reflects the development of China's construction industry. In order to further

study the fit degree between the talent training system of colleges and universities and the development of the industry, as well as the adjustment of the talent cultivation system of colleges and universities according to the current situation and future development trend of the industry, this paper takes the evolution process of the talent cultivation of engineering management major in the Civil Engineering College of Putian University as an example, and puts forward suggestions on the reform of the composite talent training system under the background of digital economy. In order to further improve the adaptability of college personnel training and post demand.

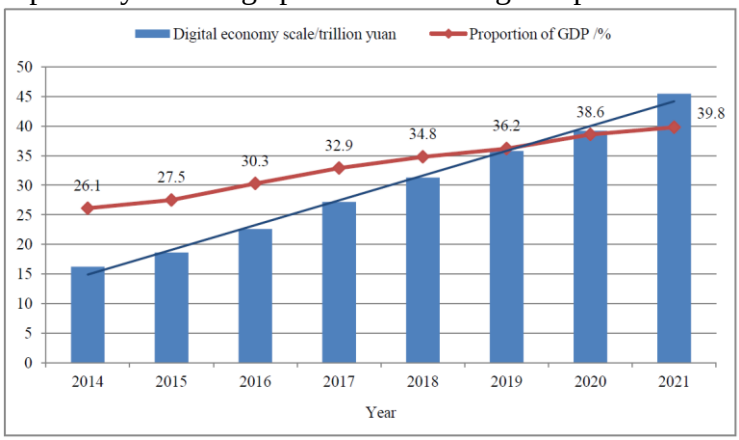

Figure 1: Distribution of digital economy scale and GDP ratio in China from 2014 to 2021.

2. Research Ideas

This paper based on the data of Engineering management major of Civil Engineering College of Putian University in recent ten years. Mainly studies the evolution of personnel training curriculum structure, curriculum content, training objectives and training results. And show the development and change history of China's construction industry. The correlation between industry reform and talent training is shown in Figure 2 below.

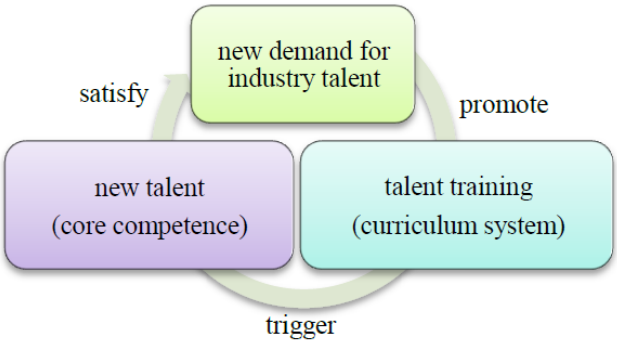

Figure 2: Correlation between industry change and talent training.

3. Evolution of the Training of Compound Talents in Engineering Management

3.1. Evolution of Industry Talent Demand

With the rapid development of China's social economy, new talents in all walks of life are in demand [9]. In response to this situation, the Ministry of Education and the Ministry of Human Resources and Social Security have repeatedly issued documents urging the reform of college education. The details of the major events of university reform from 2014 to 2019 are shown in

Figure 3. Since 2019, the Ministry of Human Resources and Social Security has released 56 new jobs. Some occupations are related to the construction industry and the interdisciplinary disciplines of the construction industry, such as Artificial Intelligence (AI) engineering technicians, Building Information Model (BIM) technicians, Virtual Reality (VR) engineering technicians, prefabricated building construction workers, building curtain wall designers, carbon emission managers, etc. The specific distribution is shown in Figure 4 below.

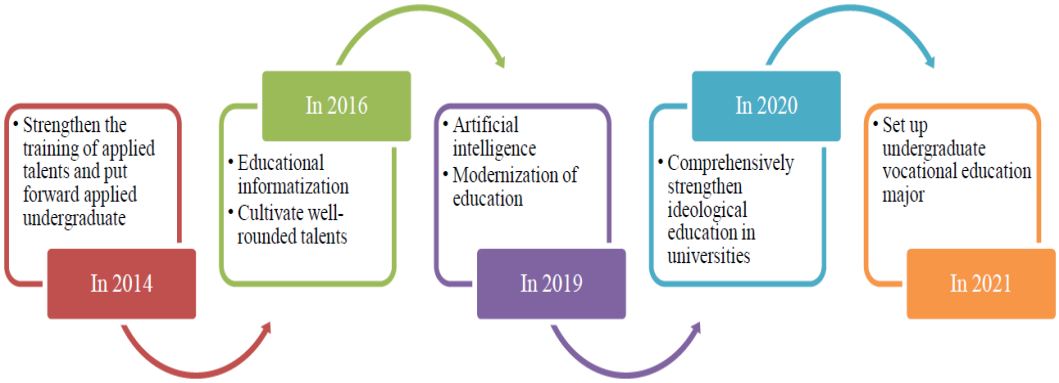

Figure 3: Major events of university reform from 2014 to 2019.

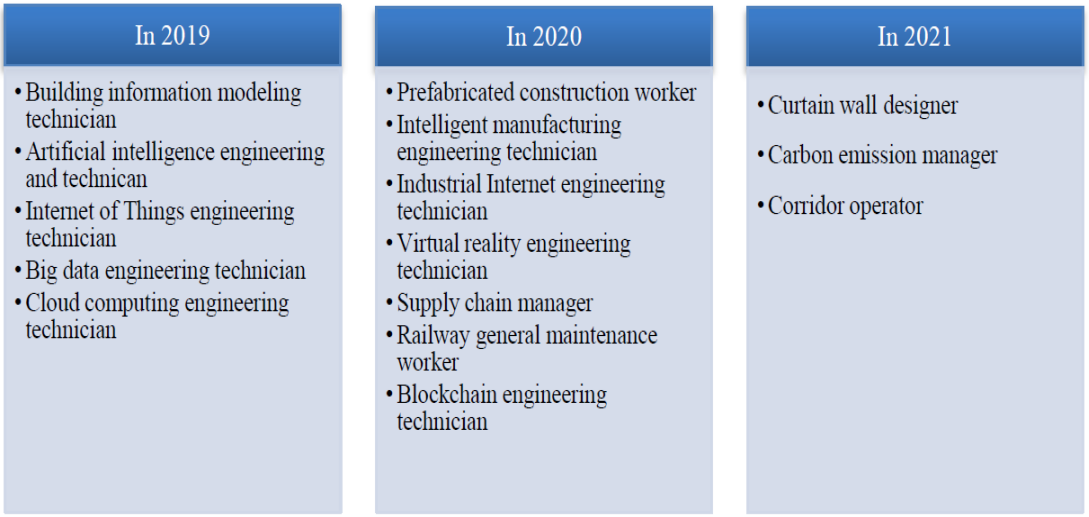

Figure 4: Distribution of newly added occupations in construction industry and cross-disciplines from 2019 to 2021.

3.2. Evolution of Curriculum System

The demand for new talents in the construction industry promotes the reform of talent training system, and the curriculum system bears the brunt. From 2012 to 2020, the course system of Engineering Management major of Civil Engineering College of Putian University has been innovated for six times. The overall course structure changes meet the requirements of application-oriented undergraduates, reducing the theoretical teaching hours, increasing the practical teaching hours in and out of class. The specific distribution of class hours is shown in figure 5 and figure. 6. In the new revised curriculum system in 2020, the number of theoretical teaching hours is slightly higher than that in 2019. The reason is that, in response to the requirements of the state, ideological and political education is paid attention to, and ideological and political theory courses in colleges and universities are further improved.

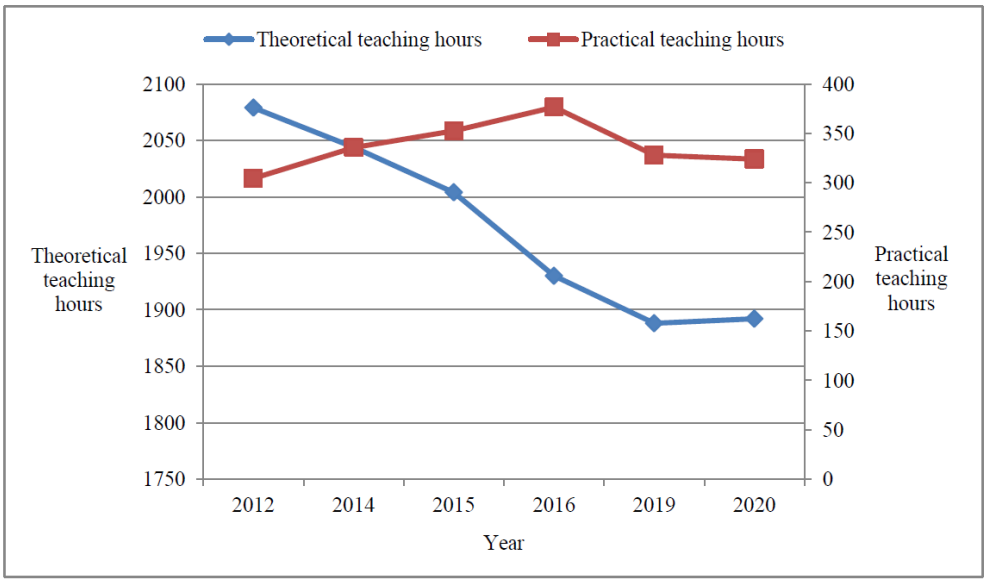

Figure 5: Distribution of theoretical and practical class hours of engineering management major from 2012 to 2020.

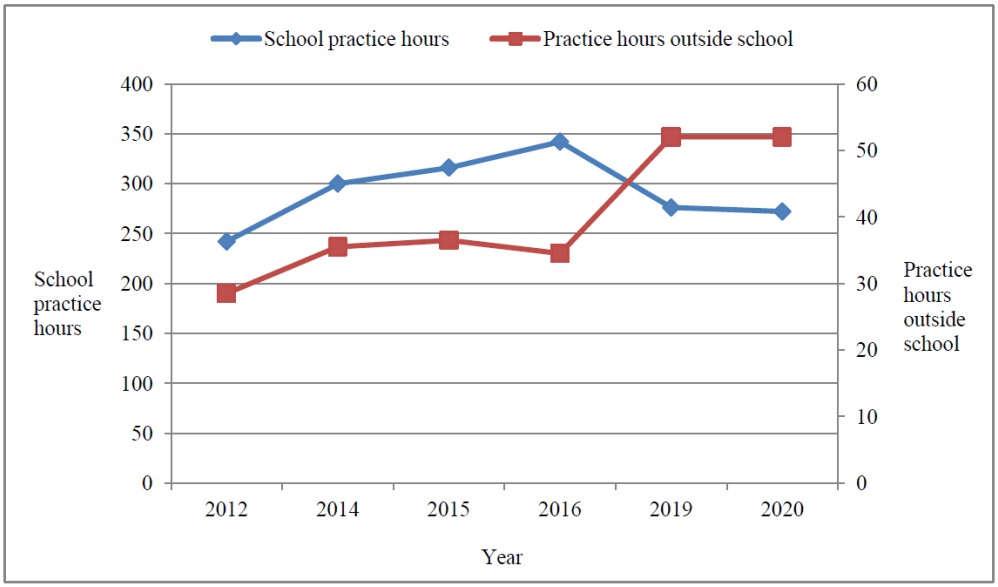

Figure 6: Distribution of practical hours in and out of school for engineering management major from 2012 to 2020.

The essence of the change of course structure is the change of course content, and the specific changes are shown in Table 1 below. According to the data analysis in the table:

Table 1: Detailed distribution of course content changes.

Year	New additions	Electives transfer to compulsory courses
2014	(1)Productive labor (2)Course design for building project evaluation (3)Construction project supervision course design (4)Physical Education (5) (5)Physical Education (6)	(1)Construction equipment (2)Course design of building engineering measurement and valuation

	(6)Innovation and entrepreneurship (7)Basic economics (8)Introduction to specialty (9)Building construction drawings (10)Construction project measurement and valuation (11)Engineering claims and risk management (12)Analysis of engineering quality accidents	
2015	(1)Civil engineering construction practice (2)Statistics (3)Introduction to Environmental Engineering	Career planning
2016	(1)Course design of engineering economics (2)Installation engineering measurement valuation course design (3)Engineering bidding course design (4)Project contract management course design (5)Real estate evaluation course design (6)Identification of construction drawing of building installation project (7)Engineering management innovation (8)Introduction to BIM technology and modeling (9)Steel structure (10)Mazu culture class	Construction laws and regulations
2019	(1)Architectural drawing practice (2)The engineering practice (3)BIM technology modeling practice (4)BIM technology application (BIM5D) (5)Project management thematic implementation (6)Real estate marketing course (7)Academic research methods (8)Management information system (9)Urban land management (10)Real estate broker (11)Subject frontier and scientific paper writing	(1)Mental health education for college students (2)Innovation and entrepreneurship (3)Overview of BIM technology and modeling
2020	(1)National security education (2)"Five five training"	

(1) Compared with 2012, great changes have taken place in the courses of ordinary colleges and universities in 2014, with the contents of many courses increased, especially practical courses. At the same time, China's higher education began to pay attention to college students' physical exercise and production and labor education;

(2) Compared with 2014, China's higher education began to pay attention to cross-disciplinary learning in 2015;

(3) Compared with 2015, the study of professional law, innovation and local culture increased in 2016;

(4) Compared with 2016, in 2019, the construction information modeling technology, professional thematic implementation, academic research and frontier study will be launched, and the education on college students' mental health will be improved;

(5) Compared with 2019, China's higher education in 2020 began to focus on overall national issues, such as national security. At the same time, local culture is integrated into professional education. Putian University has launched the "Five five training" model, which is a new model of

local traditional culture education with "great love" for Mazu culture, "great benevolence" medical culture, "great justice" overseas Chinese culture, "great beauty" Puxian culture and "master" artisan culture as the main content.

3.3. Evolution of Talent Training Objectives

The training system before 2014 has not refined the talent training standards, and only expresses the training objectives from a macro perspective. In 2014, the reform formulated the talent training standards and realization matrix, which mainly refined the talent training standards from three aspects of knowledge, ability and literacy, and realized the talent training standards through courses, activities, competitions, lectures and other ways. In 2015, the degree awarded by the engineering management major in the School of Civil Engineering of Putian University officially changed from the degree of management to the degree of engineering, which further improved the application-oriented requirements for the cultivation of talents in this major. Since 2016, the graduation ability requirements have been refined from three aspects of quality, knowledge and ability in the training objective system of engineering management major, and it is clear that the first thing for talent training is the cultivation of ideological, cultural and physical quality, which is in line with the fundamental requirements of "learning to be a person before learning to do things" of personnel training in China.

In summary, the talent training objectives have evolved from extensive to precise, and the implementation methods have been formulated according to the training requirements one by one. In addition, the effectiveness of talent training has been fully verified from the perspective of graduation ability.

4. Evolution of the Training Effect of Interdisciplinary Talents in Engineering Management

Graduation comprehensive practical training (graduation design, graduation thesis) is a comprehensive summary and inspection of the early results of talent training in colleges and universities. It's also an important link to reflect their knowledge mastery, practical application ability and innovation ability [10]. Therefore, the most intuitive performance of talent training is the comprehensive training results of graduation. Based on the comprehensive practical training results of engineering management graduates in the past six years, this paper makes a statistical analysis and analyzes the effect of talent training through quantitative data.

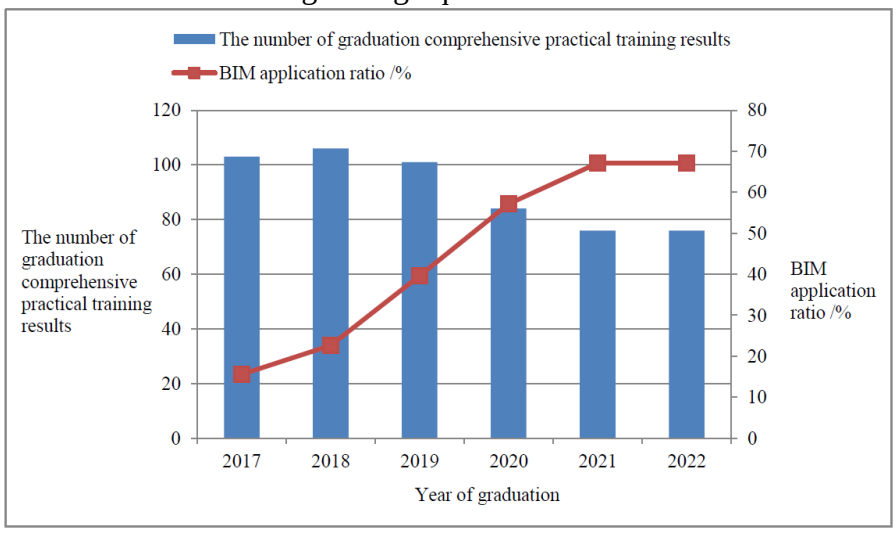

Figure 7: Application of BIM technology in graduation comprehensive training.

As can be seen from the data in Figure 7, the application of BIM technology in graduation comprehensive practical training has been increasing year by year. At present, BIM technology has been fully applied in the graduation comprehensive practical training in the fields of construction organization design, budget and project management. BIM technology has become a basic requirement for graduation. Judging from the comprehensive practical training content of graduation, BIM technology has developed from the initial modeling and roaming to the current calculation, sunshine analysis and BIM5D application. In recent years, some students began to combine prefabricated building, green building and BIM technology in their graduation comprehensive practical training.

From the above analysis, it can be seen that the talent training of the engineering management major of Putian Yuan has gradually been closely related to the digital economy, smart architecture and other contents, and the talent training keeps pace with the development of the market and the industry.

5. Conclusion

Combined with the talent training data of Engineering Management major of Civil Engineering College of Putian University from 2012 to 2020, this paper analyzes the evolution process of composite talent cultivation in colleges and universities under the background of digital economy from four aspects: curriculum structure reform, curriculum content change, training objectives evolution and talent cultivation results. Research shows that:

(1) The curriculum structure of compound talents cultivation in general colleges and universities is changing from theory to practice, from traditional to modern in curriculum content, from rough to fine in talent cultivation objectives, and from keeping pace with The Times in talent cultivation effectiveness;

(2) The evolution of talent cultivation in colleges and universities is consistent with the economic and social development and the changes in industrial talent demand, that is, the development of digital economy—new occupation—new technology—new talent demand—talent cultivation system reform—new talent cultivation results—further economic development and reform.

Therefore, while paying attention to the forefront of scientific research, college teachers should pay attention to the direction of social and economic development, timely adjust the teaching content, and constantly improve themselves, in order to cultivate compound talents in line with the needs of the development of digital economy.

Acknowledgements

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References

[1] Luo H. Q., Li W. M., Cai Z. Y. and Luo H. (2023). The Environmental Effects of Digital Economy: Evidence from Province-Level Empirical Data in China. Environmental Science and Pollution Research International, 2023.

[2] Zhang J. Y. (2022). China Academy of Information and Communications Technology Releases China Digital Economy Development Report (2022). Science and Technology China, 2022(08): 104.

[3] Lin X. J. and Lei R. F. Prediction of Digital talent Demand in Fujian Province. Journal of Putian University, 2019, 26(06): 103-108.

[4] Zhang L., Wang L. X. & Hu Y. N. (2021). Causes and Suggestions of Digital Talent Shortage in China. Information

and Communication Technology and Policy, 2021(12): 76-80.
[5] Chen Y. (2023). Digital Economy, Science and Technology Innovation and Carbon Emissions - A Dynamic Analysis of PVAR Based on Provincial Panel Data. Journal of Risk Analysis and Crisis Response, 2023, 13(1).
[6] Meng C. (2022). Discussion on the Cultivation of Architectural Talents in Applied Universities in Digital Transformation. Industrial Engineering and Innovation Management, 2022, 5(13).
[7] Ruan J. W. (2021). A Special Study on the Development of New Occupations and New Employment in the Context of Online New Economy in 2021. Big Data Era, 2021(12): 62-76.
[8] Sun H. Y. (2021). 2021 White Paper on the Development of New Occupations and New Jobs in the Context of Online New Economy. International Brand Review, 2022(05): 73-76.
[9] Didier N. (2022). Are We Ready? Labour Market Transit to the Digital Economy. Journal of Adult and Continuing Education, 2022, 28(1).
[10] Hua J., Jia, N., Liu C., Chen G. W. and Ge B. (2018). Exploration and Practice of University-enterprise Cooperation to Improve the Quality of Engineering Undergraduate Graduation Design. Teaching and Educating (Higher Education Forum), 2018(03): 48-49.