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Exploration and Practice of the "3+4" Vocational-Undergraduate Integrated Talent Cultivation

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Abstract: With the transformation of China's economy and the rapid growth of the digital economy, the demand for highly skilled talents continues to rise. This demand has prompted the education system to undergo reforms to cultivate talents capable of adapting to the new economic landscape. The "3+4" vocational-undergraduate integrated talent cultivation pilot project is part of China's deepening educational reforms, aimed at achieving integrated development in vocational education and addressing the talent gap in the transformation and upgrading of industries. This paper addresses challenges that have emerged in the implementation of the "3+4" integrated program, such as insufficient integration motivation, lack of integrated curriculum design, and ineffective support mechanisms. It proposes a series of talent cultivation measures, including clarifying training objectives, constructing an integrated talent development plan, and enhancing digital teaching methods. Through the implementation of these curriculum reforms, the project has enhanced students' capabilities in both academic and practical outcomes.

Keywords: "3+4" model; Vocational-undergraduate integration; Talent cultivation

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1. Introduction

With the economic transformation and upgrading in China, particularly the rapid development of the digital economy, the demand for highly skilled talents is growing progressively. To meet the development needs of the modern vocational education system, especially under the backdrop of digitalization and intelligence, higher requirements are set for the cultivation of technical and skilled talents. In 2018, Zhejiang Province of China initiated a pilot program for integrated talent cultivation between secondary vocational schools and applied undergraduate colleges [1,2], and our school actively responded by becoming one of the first pilot units for this integrated talent cultivation model. The integrated cultivation approach designs a holistic talent development plan and ensures a smooth transition between different educational stages, aiming to cultivate compound technical and skilled talents in specialized fields that require long-term education. The "3+4" model of integrated vocational and undergraduate education is a new mode of integrated cultivation, where students

undergo three years of secondary vocational education and then, upon meeting certain criteria, are assessed and, if qualified, proceed to four years of vocational undergraduate education [3]. This new model is not a simplistic splicing of different levels of academic qualifications, nor should it be simplistically understood as a shortcut for vocational students to advance their studies. Its cultivation goals and standards are designed as an integrated seven-year plan, and the training programs and curriculum systems are also integrated over seven years. As a pilot for long-term education, the fundamental purpose of this integrated cultivation model is to adapt to future technological and economic development by segmenting the training to produce high-level technical and skilled talents.

On the other hand, as the new round of technological revolution and industrial transformation deepens, digital technology has become a key force in driving social change. The field of education urgently needs to undergo digital transformation to adapt to the new requirements brought about by technological development. The report of the 20th National Congress of the Communist Party of China proposed to promote the digitalization of education and build a learning society and a major learning country for lifelong learning for all citizens. Digital education is seen as an important breakthrough in opening up new tracks for educational development and shaping new advantages in educational development. This project aims to implement the integrated talent cultivation model of digital media technology in vocational and undergraduate education. By constructing an integrated training plan and upgrading the construction of an integrated intelligent curriculum system, students are provided with high-quality digital teaching resources and richer and more flexible learning opportunities, to continuously improve the quality and efficiency of education, systematically cultivate undergraduate-level compound applied senior engineering technical talents, and provide talents for the digital economic development of Zhejiang Province.

2. Issues arising in the cultivation process

2.1. Insufficient momentum

The student body of the vocational-undergraduate integrated program primarily consists of vocational school students. Although there is a mechanism for assessment and evaluation at the transition stages, it is not well-optimized and often remains in a state of "each managing their own segment." The cultivation goal of vocational schools is mainly focused on academic advancement, and the vast majority of vocational students can transition to the corresponding higher education institutions through single examinations and admissions, with relatively low academic pressure. The emphasis is on the safe transition of students to the corresponding higher education institutions, resulting in lower assessment and teaching pressures. However, once students enter the joint undergraduate institutions, they do not have a significant advantage in terms of cultural course foundation or professional skills.

2.2. Lack of integrated design

The connection of the curriculum system is the core of the vocational-undergraduate integrated talent cultivation model. Joint majors need to sort out the curriculum system, and the vocational-undergraduate curriculum requires integrated design. According to research, joint majors are generally able to design professional courses based on their different stage cultivation goals, but it is difficult to cross institutions to conduct in-depth, precise research and curriculum system reconstruction together. The higher education institutions, with their own educational experience and talent cultivation models, differ significantly from vocational education, increasing the difficulty of integrated design of the vocational-undergraduate curriculum system. There are issues such as a high repetition rate in some professional courses, and the inability to accurately grasp the knowledge

and skill connection points, making it challenging for teaching content to effectively connect and gradually deepen. Public foundation courses are influenced by policies, textbooks, and other factors, making it even more challenging to effectively connect, and there is a lack of a unified platform for communication and coordination. Teaching methods are generally dominated by lecture methods, task-driven methods, project teaching methods, case teaching methods, and demonstration methods, with not much distinction in the teaching process. There are widespread difficulties in aspects such as talent cultivation positioning, clarification of occupational orientation range, curriculum system construction, knowledge and skill connection point sorting, and increasing the participation of higher-level institutions.

2.3. Lack of effective transition support mechanisms

In the vocational-undergraduate transition process, teaching processes, teaching management, resource sharing, quality monitoring, and enrollment systems are all important points for connection. Currently, there is a lack of top-level design, and regional vocational-undergraduate connection professional planning, with the overall fit between majors and industries being low; there is a lack of specific transition selection exams for vocational-undergraduate integrated majors, and vocational students who have entered the vocational-undergraduate integrated program only need to participate in the separate examinations and admissions for higher vocational education to reach the college line (Zhejiang Province rank 9000+ before) to advance to the undergraduate stage, while ordinary vocational students need to reach the undergraduate line (Zhejiang Province rank 400+ before). Comparing the two, it is evident that the current vocational-undergraduate transition selection is relatively simple and does not truly select students with strong abilities; there is a lack of policy documents on specific implementation requirements for teaching in vocational-undergraduate integrated majors at the management level, and connecting institutions lack operable standards, making it difficult to uniformly plan for course design and connection points; there is a lack of diverse evaluations at different levels and quality tracking and evaluation mechanisms for vocational-undergraduate integrated talent cultivation.

3. Countermeasure research

We have adopted the principle of integrated design to construct the talent cultivation system framework depicted in **Figure 1**, which is characterized by "one center, dual drivers, three-wing collaboration, and four-dimensional focus" to systematically implement a 7-year continuous education model that integrates secondary vocational education with undergraduate studies.

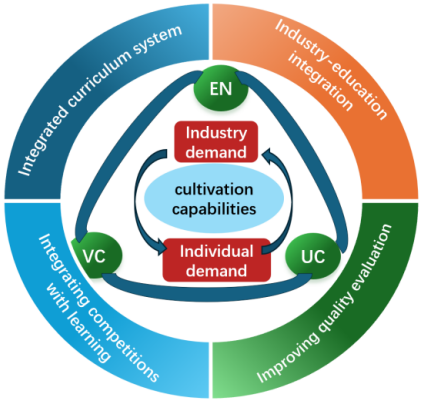

Figure 1. The talent cultivation system framework (VC: secondary vocational schools; UC: undergraduate colleges; EN: enterprises)

The "one center" refers to the core focus on the cultivation and enhancement of students' capabilities. The "dual drivers" are oriented by the demands of regional industries and enterprises for technical and skilled talents, as well as the individual growth needs of students, to set professional talent cultivation goals, construct curriculum systems, implement course teaching, and evaluate talent cultivation outcomes. The "three-wing collaboration" involves the deep integration of the advantages of applied undergraduate colleges, secondary vocational schools, and industry enterprises, establishing an organizational structure of "industry enterprise guidance, undergraduate college leadership, and secondary vocational school main body." Each party plays its role, fulfills its responsibilities, and demonstrates its strengths, collaboratively promoting the in-depth development of the pilot project. The "four-dimensional focus" follows the laws of talent cultivation and implements reforms in the talent cultivation model that conforms to the technical and skilled application-oriented model. Specifically, it is necessary to carry out four key tasks: "constructing an integrated curriculum system [4], implementing industry-education integration [5,6], integrating competitions with learning, and improving quality evaluation" to ensure the ultimate realization of talent cultivation goals.

4. Implementation

In September 2022, the first batch of students from the Digital Media Technology vocational-undergraduate integrated major entered our school for undergraduate studies. An analysis of their first year of study revealed that compared to students admitted through the general recruitment process, vocational-undergraduate students faced learning difficulties in many courses, with a much higher failure rate. Some students even began to exhibit negative emotions such as aversion to studying and fear of challenges. In response to this situation, the Digital Media Technology major attached great importance to the issue and, with the support of the Academic Affairs Office and the college, began to study the vocational-undergraduate integrated talent cultivation model and took a series of measures.

4.1. Clarifying the cultivation goals

Starting in April 2022, the major cooperated with the Academic Affairs Office to organize multiple research meetings, inviting leaders and teachers from secondary vocational schools to our school for discussions. The cultivation goals for the Digital Media Technology vocational-undergraduate integrated major were clarified: to face the internet field, learn the basic theories, basic skills, and basic methods of digital media technology and development, and receive basic training in design, production, and software development in the field of computer, media, and network convergence. Using digital media as a carrier, students systematically learn and research the knowledge and skills of internet product demand analysis, interaction research, visual design, system architecture, code development, product testing, and product management and operation, especially for wireless mobile internet products. The goal is to enable students to organically combine technical development with artistic design capabilities, use cutting-edge computer internet application technology, integrate interaction methods and visual design that comply with ergonomics, and create easy-to-use internet application products. Students are expected to become compound application-oriented senior engineering technical talents who can engage in analysis, design, creativity, production, development, testing, manufacturing, teaching, and other work in various application fields of digital media.

4.2. Reconstructing the curriculum system

After clarifying the cultivation goals and direction, the curriculum system for "vocational-undergraduate

integration" was reconstructed as shown in **Figure 2**. The curriculum system for vocational-undergraduate integration must conform to the mental characteristics, cognitive patterns, and development needs of students at different ages. Such a curriculum is not a simple addition of "vocational courses" and "undergraduate courses," but rather aims to strengthen students' humanistic literacy and professional capabilities, achieving synchronous enhancement of knowledge, skills, and attitudes. Therefore, in the process of integrating courses, the curriculum system was reconstructed through operations such as adding, deleting, weakening, strengthening, and advancing courses, to improve the connection between courses at different stages.

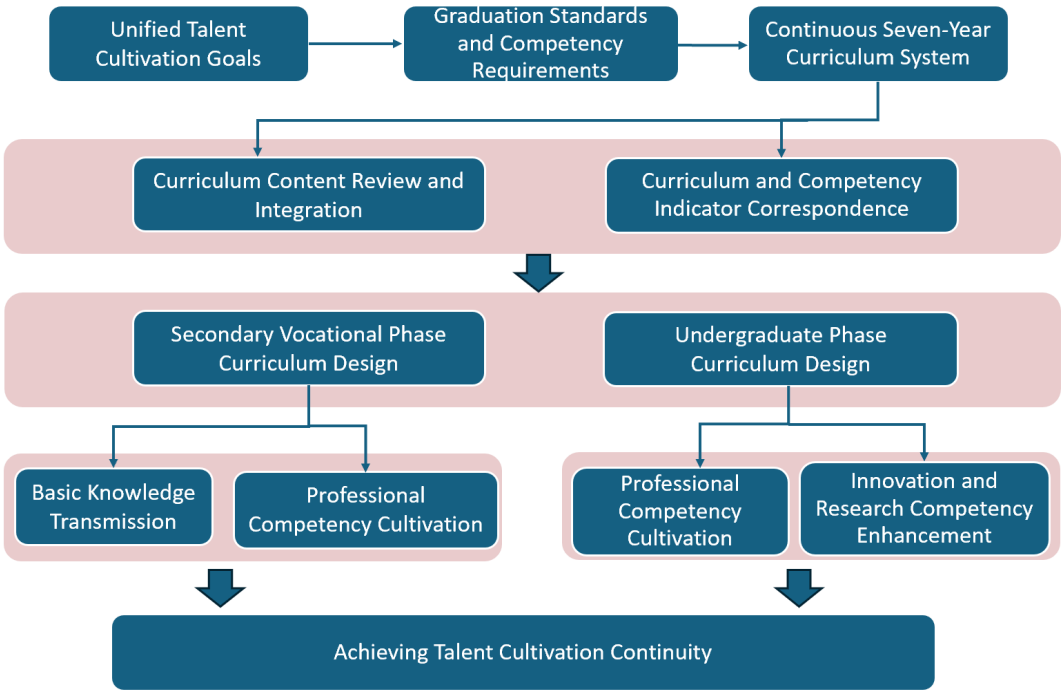

Figure 2. The curriculum system for vocational-undergraduate integration

Based on the curriculum reform requirements of the two secondary vocational schools we cooperate with (Ningbo Vocational Education Center College and Hangzhou Electronic Vocational and Technical School), the courses after 2021 differ according to the requirements of various education bureaus. Therefore, we revised the 2021 version and formed the 2022 and 2023 versions of the cultivation plan. On September 22, 2022, an expert review meeting was held, and the digital media technology vocational-undergraduate integrated 7-year consistent cultivation plan was finally formed after expert certification.

4.3. Empowering teaching with digital technology

The Digital Media Technology vocational-undergraduate major encourages teachers to actively adopt more flexible and interactive digital teaching methods, such as online learning platforms, virtual reality (VR) and augmented reality (AR), electronic whiteboards and smart classrooms, online collaboration tools, learning management systems, mobile learning applications, etc., to stimulate students' interest in learning and increase student participation and motivation. Teachers are also encouraged to obtain and share a wealth of teaching resources, including electronic textbooks, online courses, virtual laboratories, video lectures, audio materials, interactive simulations, animations, and educational games, providing personalized learning resources and paths to meet the learning needs of different students and improve learning efficiency and quality. Courses with digital

teaching methods already in place are listed in **Table 1**.

4.4. Strengthening and improving the practical teaching system

The talent cultivation goal of the vocational-undergraduate integrated training model is to cultivate application-oriented senior engineering technical talents with rich practical experience and a solid theoretical foundation. Therefore, in the vocational-undergraduate talent cultivation process, the main line of innovative practical teaching should be firmly grasped. By organically combining professional direction with learning interests through innovative practice, students' learning potential and initiative are continuously stimulated, fully reflecting the advantages of long-term education and early entry into the field.

Table 1. Courses with digital teaching methods

No.	Course names	Digital methods and resources
1	Fundamentals of Programming	Baiteng Education PTA Platform
2	Advanced Programming	Baiteng Education PTA Platform
3	Internet Product Interaction Design	BB Teaching Management Platform, Bilibili Resources
4	Graphic Technology	Multimedia Teaching Resources (Video Lectures)
5	Software Engineering	BB Teaching Management Platform, Zhihuishu, Yu Classroom
6	Internet Product Visual Design	BB Teaching Management Platform
7	Virtual Reality and Digital Interaction	BB Teaching Management Platform, VR and AR Tools
8	Mathematics and Physics in Games	PTA Online Learning Platform, Online Grading System, Chaoxing Classroom Tools, Video Network Teaching Resources

5. Phased achievements

Through the implementation of a series of curriculum reforms, the performance of students in experimental and practical courses has significantly improved. Taking the 2021 intake as an example, the average scores, excellent rates, and pass rates in courses such as "HTML5 Programming," "Internet Product Interaction Design," "Internet Product Design Course Design," "Internet Product Visual Design," and "Graphic Technology" for the Digital Media students in the combined enrollment program are all superior to those in the general enrollment class. The specific data is shown in **Table 2**.

Additionally, under the active guidance of the Digital Media faculty, students in the integrated program have been actively participating in various competitions and applying for internship positions. Over a span of three years, these students have taken part in more than 50 different competitions, winning numerous awards, including several high-level national and provincial contests such as the ICPC, CCPC, and CCCC. By engaging in internships and these high-level competitions, the students' practical skills and problem-solving skills have been significantly enhanced, laying a solid foundation for their future careers. At the same time, these competition achievements not only add luster to the students' resumes but also bring honor to the school, enhancing the social influence and industry recognition of our major.

Table 2. Performance comparison of students between integrated program and general enrollment

Major names	Course names	Average score	Excellent rate	Pass rate
Digital Media Technology	HTML5 Programming	57.82	0%	60.81%
Digital Media Technology (Integrated Program)	HTML5 Programming	63.03	0%	75%
Digital Media Technology	Internet Product Interaction Design	62.64	8.11%	74.32%
Digital Media Technology (Integrated Program)	Internet Product Interaction Design	81.78	11.11%	100%
Digital Media Technology	Internet Product Design Course Design	59.59	5.41%	72.97%
Digital Media Technology (Integrated Program)	Internet Product Design Course Design	81.47	11.11%	100%
Digital Media Technology	Internet Product Visual Design	78.15	29.63%	88.89%
Digital Media Technology (Integrated Program)	Internet Product Visual Design	76.92	11.54%	92.31%
Digital Media Technology	Graphic Technology	83.33	45.24%	90.48%
Digital Media Technology (Integrated Program)	Graphic Technology	89.42	65.39%	96.15%

6. Conclusion

In summary, the adjustment of foundational course syllabi has led to a marked reduction in failure rates among vocational-undergraduate students, yielding positive outcomes. The integration of a cohesive curriculum system and the enhancement of digital teaching methods have notably improved the performance of these students in experimental and practical courses, with the 2021 cohort demonstrating superior academic metrics in key subjects compared to their peers. Furthermore, the practical teaching initiatives have been highly effective, with students actively engaging in competitions and internships, resulting in a substantial number of awards and a solid foundation for their professional development. These achievements have not only strengthened the students' profiles but also contributed to the school's reputation and the industry's recognition of our program.

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Disclosure statement

The author declares no conflict of interest.

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