

Practical Research on Integrated Curriculum System in Secondary and Higher Vocational Education——Taking the Construction Engineering Technology Major of Zhejiang School A as an Example

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Abstract: The construction engineering technology major has implemented the five-year system of integrated talent cultivation in secondary and higher vocational schools for a considerable period of time. This talent cultivation mode shortens the academic system and improves the efficiency of talent cultivation. On the other hand, students are exposed to professional knowledge and skills from the secondary vocational stage, and the integration of secondary and higher vocational education is conducive to improving the quality of talent cultivation. However, in the process of practice, there are still some problems in the integrated talent cultivation in secondary and higher vocational schools, such as vague training objectives, inconsistent teaching standards, repetitive curriculum content, and poor management mechanisms. This article takes the construction engineering technology major in Zhejiang Province A higher vocational education (integration of secondary and higher vocational education) as an example, analyzes the current practice status of integration of secondary and higher vocational education, summarizes outstanding experience, and proposes suggestions to improve the quality of talent cultivation in construction engineering technology, aiming at the problems such as weak level of training objectives, poor progressive connection of curriculum system, small amount of training equipment, slow update, and single evaluation method, Promote the integrated development of secondary vocational schools and vocational colleges, and meet the urgent demand of high-end industries for high-level technical and skilled personnel.

Keywords: Integration of secondary and higher vocational education; Curriculum system; Current situation analysis

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1. Introduction

In June 2021, the Zhejiang Provincial Department of Education issued the “Zhejiang Province Integrated Curriculum Reform Plan for Higher Vocational Education”, which proposed that deepening the connection between higher vocational education and secondary vocational education and strengthening the integrated training of higher vocational education and secondary vocational education are important ways to accelerate the construction of a modern vocational education system with Chinese characteristics and continuously improve the adaptability of vocational education. In recent years, Zhejiang Province has explored and promoted curriculum reform and integrated talent cultivation in secondary and higher vocational schools, and achieved good results, forming a brand effect throughout the country. However, in practical work, there are still problems such as vague training objectives, inconsistent teaching standards, repetitive curriculum content, and poor management mechanisms. Compared to the national positioning for the development of vocational education, the demand for high-quality technical and skilled personnel for regional economic development, and the good expectations of the people for vocational education, there is still a certain gap. ^[1] As a highly specialized higher

vocational college, Zhejiang A Higher Vocational Education has achieved certain results and experience in the reform of the integrated curriculum of secondary and higher vocational education in its construction engineering technology specialty, which is a double-high construction specialty in Zhejiang Province. Starting with the talent cultivation plan, this article expounds the current situation of the integrated talent cultivation objectives, curriculum system, teaching resources, and evaluation system of the construction engineering technology specialty in the secondary and higher vocational education, Analyze the shortcomings of the integrated curriculum system in secondary and higher vocational education, and propose targeted suggestions for further optimizing the integrated curriculum system in secondary and higher vocational education and unblocking the growth channels for high-level technical and skilled talents.

2. The Current Situation of Integrated Curriculum System for Construction Engineering Technology Majors in Secondary and Higher Vocational Colleges

2.1 The level of talent training objectives is not strong

Integrated talent training in secondary and higher vocational education is usually carried out by cooperative colleges and universities jointly formulating a set of personnel training programs, with a training goal that does not separately set secondary or higher vocational education goals, so it cannot reflect the hierarchical nature of talent training in secondary and higher vocational education. In the process of talent training in secondary and higher vocational education, the goal is vague, leading to a focus on whether to enter higher vocational education and ignoring the cultivation of professional abilities; In addition, secondary vocational colleges will cooperate with multiple vocational colleges, and there will be multiple sets of talent training programs and multiple talent goals. During the training process, there will be situations where there are no goals, multiple goals, and randomly set goals. Taking the major of construction engineering technology as an example, its talent cultivation goal is to “cultivate highly skilled talents who are required by the frontline technology application and management in the field of engineering construction, have good professional ethics and dedication, master the basic theoretical knowledge of construction engineering construction and management, have the ability to organize and manage construction engineering, and comprehensively develop morally, intellectually, physically, and aesthetically.” As can be seen, The above requirements for knowledge and ability are beyond the reach of students in secondary vocational education. However, due to the lack of a clear goal for talent cultivation in secondary vocational education, most secondary vocational colleges adopt the high school style theoretical knowledge teaching method in the talent cultivation process, with the goal of successfully “enrolling” students in higher vocational education.

2.2 The curriculum system ignores cohesion and duplicates content

The professional courses of construction engineering technology consist of public compulsory courses, public limited optional courses, public optional courses, professional compulsory courses, professional limited optional courses, and professional optional courses. The courses offered are jointly discussed by the teaching and research offices of secondary vocational colleges, professional teaching and research offices of higher vocational colleges, basic departments, and cooperative enterprises, and will be finalized after discussion with industry experts. From the perspective of the curriculum schedule, the proportion of various courses meets the requirements of the Guiding Opinions on the Formulation and Implementation of Professional Talents Training Plans in Vocational Colleges (JZC [2019] No. 13) (as shown in Sheet1). However, research has found that all courses are offered, and there are problems such as overlapping and duplication of course content, lack of advanced courses, and so on (as shown in Sheet2).

Sheet1 Requirements of “Guiding Opinions on the Formulation and Implementation of Professional Talent Training Plans in Vocational Colleges” (JZC [2019] No. 13)

Course category	Class hour period	Proportion in total professional class hour period (%)	Practical Hours	
			Class hour period	Proportion
Public Compulsory Course	468	16.79%	256	54.70%
Public Restricted Courses	240	8.61%	0	0.00%
Public Optional Courses	80	2.87%	0	0.00%
Major Required Courses	1440	51.65%	1154	80.14%
Limited Professional Elective Courses	500	17.93%	220	44.00%
Professional Optional Courses	60	2.15%	30	50.00%
Total	2788	100%	1660	59.54%

Sheet2 Partial Curriculum Schedule

Course Name	Educational Institutions	Deficiencies
Building Mechanics 12	Secondary vocational schools	The course content is overlapping and cannot reflect the hierarchy
Building Mechanics 2	Higher vocational colleges	
Construction process of building engineering	Secondary vocational schools	All belong to construction courses, with overlapping and repetitive course contents
Building Construction Drawing Reading	Secondary vocational schools	
Foundation engineering construction	Higher vocational colleges	
Building construction setting out	Higher vocational colleges	
Construction of main works	Higher vocational colleges	
Decoration and Roof Engineering Construction	Higher vocational colleges	
Revit software application	Higher vocational colleges	Software courses, no prerequisite courses set

2.3 Insufficient number of training equipment, slow update

According to the talent cultivation plan, the basic requirements of the construction engineering technology specialty for the campus training room are: it should meet the needs of practical teaching links such as drawing recognition training, structural cognition training, measurement training, CAD operation training, type of work training, construction technology training, construction organization training, measurement and pricing training, construction quality inspection training, BIM modeling and application training, building materials experiments, mechanical experiments, structural experiments, and other practical teaching links. However, the proportion of theoretical teaching in secondary vocational schools is high, with a large number of students in higher vocational schools, a limited number of training rooms, slow updates of machinery and equipment, and unable to keep up with the development of the industry, which cannot meet the training needs. Taking the architecture major of a vocational college in Zhejiang Province School A as an example, there are currently seven computer rooms available for teaching CAD courses, while only two REVIT and BIM computer rooms are available, completely unable to meet the requirements of curriculum settings. Some courses take the campus as the training venue and teaching buildings as the training objects. Students cannot feel the real construction site situation, and the training effect is not ideal (Sheet3).

Sheet3 Training Course Resources

Training Program	Teaching/training venue	Whether the existing teaching venues, equipment, and resources meet the curriculum requirements	Reasons
Practical Training of Map Reading	Ordinary multimedia classroom, Computer room	Yes	
Constructive Cognitive Training	Training Building	No	Students mainly visit, and the number of models is insufficient
Measurement Training	Campus	Yes	
CAD Operation Training	Computer room	Yes	
Practical training of work type	Not opened		
Construction Technology Training	Training Building	No	Equipment aging
Construction Organization Training	Generator Room	No	Equipment aging

Practical Training on Measurement and Pricing	Ordinary multimedia classrooms, campus	Yes	
Practical Training on Construction Quality Inspection	Ordinary multimedia classrooms, campus	No	The campus is full of buildings that have passed inspection, and students cannot feel the true situation of the construction site
BIM Modeling and Application Training	Generator Room	No	Insufficient equipment quantity
Building Materials Experiment	No courses offered		
Mechanical Experiments	No Equipments		
Structural Tests	No Equipments		

2.4 Enterprise teacher shortage

Although most of the teachers in the school are “double qualified” teachers with dual certificates, they do not have actual industry work experience and are not truly “double qualified” teachers. The annual corporate temporary job training is a mere formality, and teachers’ professional knowledge, including some professional skills, mostly stays at the theoretical level, unable to guide students to master the knowledge and skills required for actual positions. However, teachers on campus are limited by the requirements for personnel assessment, and they cover almost all other courses for students except for internships. When hiring enterprise teachers in higher vocational colleges, it is often difficult to hire them for a long time due to limited class hours and low class fees. Enterprise teachers who are willing to attend classes lack educational and teaching knowledge, are not familiar with the growth laws of students, and have poor teaching results. [2] However, only first-line masters of enterprises can introduce the real situation of their enterprises to students, and only first-line masters can impart the most advanced technology to students.

2.5 Single evaluation method

Strengthening the quality monitoring of the teaching process and reforming the standards and methods of teaching evaluation are the main directions of integrated assessment and evaluation in secondary and higher vocational schools. The talent cultivation plan requires that the evaluation content of students’ academic performance should take into account aspects such as cognition, skills, and emotions, reflecting the diversity of evaluation standards, evaluation subjects, evaluation methods, and evaluation process. Multiple evaluation and evaluation methods can be used, such as observation, oral examination, written examination, placement operation, vocational skill competition, and vocational qualification appraisal. At the same time, third-party evaluations are encouraged. However, in the actual process of talent cultivation, secondary vocational schools generally adopt the assessment method of general high school - mid-term and final written examinations or periodic written examinations. The selection examinations for secondary vocational schools to higher vocational schools also adopt a single written examination. In higher vocational schools, most of them adopt the forms of investigation, computer practice, writing, on-the-job practice, and written examinations, which basically do not involve third-party evaluation.

3. Analysis on the Causes of the Problems of the Integration of Curriculum System in Higher Vocational and Middle Vocational Education of Architectural Engineering Technology Major

3.1 Inadequate interpretation of norms and standards

In order to comprehensively improve the quality of high-quality technical and skilled personnel training, the country has issued a series of policy documents on promoting the close connection and thorough training of secondary and higher vocational education, exploring the long-term education system for high-end technical personnel training mode. In June 2021, the Zhejiang Provincial Department of Education issued the “Zhejiang Province Integrated Curriculum Reform Plan for Middle and Higher Vocational Education”, which clarified the basic principles and reform tasks of the integrated curriculum reform for middle and higher vocational education, and also proposed measures in terms of implementation guarantee. However, various middle and higher vocational schools still have not been very clear about how to promote the integrated curriculum for middle and higher vocational education. The

Department of Education and other relevant government departments have not conducted in-depth interpretation and have not taken the lead, As a result, the integrated curriculum reform in secondary and higher vocational schools only stays on the surface and cannot be implemented.

3.2 Intercollegiate discussions become mere formality

Cooperative colleges that integrate secondary and higher vocational education generally hold special seminars on issues such as the revision of talent cultivation plans, teaching management convergence, and enrollment methods. However, in actual discussions, most of them first introduce the existing teaching resources and teaching capabilities of their respective colleges, and on this basis, coordinate the formulation of talent cultivation plans that meet the requirements of policy documents. Taking the curriculum as an example, some necessary courses may not be provided if no one is available due to a lack of teachers. In fact, one or two seminars and symposiums cannot solve the problem of the integrated curriculum system in higher vocational education. What needs to be established is regular, normalized, and thematic discussions, which cannot be discussed for communication.

3.3 Incomplete supervision and evaluation system

Currently, the evaluation of higher vocational colleges is mostly comprehensive, and there is no separate integrated curriculum evaluation for secondary and higher vocational colleges. The pressure on curriculum reform in secondary and higher vocational colleges is not strong, and the motivation is not strong. Based on the previous year, the talent cultivation plan and curriculum standards have been revised around factors such as employment orientation, enterprise standards, job requirements, industrial structure adjustment, and technological level progress. The professional curriculum system modules have been adjusted at any time, and the curriculum content has been modified^[3], The lack of supervision in the revision and implementation process, and the lack of testing of whether the corresponding knowledge and abilities of the revised curriculum meet the job standards, conform to the laws of education and teaching, and reflect the characteristics of vocational and technical education, are important gaps in the current curriculum integration reform in higher vocational schools.

4. Construction Path of Integrated Curriculum System for Middle and Higher Vocational Education in Construction Engineering Technology Major

4.1 Establish a sense of integration and ladder talent cultivation goals

On the basis of integrated talent cultivation standards and talent cultivation plans, we also attach importance to the talent cultivation objectives at the secondary vocational level. The curriculum system should be designed to connect the progressive nature of talent cultivation in terms of knowledge and technical skills, and achieve progressive vocational ability cultivation, upgrading of core competence levels, and talent team echelon construction. The “Teaching Standard for Construction Engineering in Secondary Vocational Schools [Trial Implementation]” clearly states that it is aimed at building construction, establishing supervision, and establishing engineering consulting industry enterprises, cultivating high-quality workers and skilled talents who are engaged in construction technology and safety management, engineering quality and material testing, and construction engineering supervision, and comprehensively developing moral, intellectual, physical, and aesthetic skills. According to the “Technical Standards for Construction Engineering in Higher Vocational Colleges”, this major cultivates students with strong ideals and beliefs, comprehensive development in morality, intelligence, physique, beauty, and labor, a certain level of scientific and cultural literacy, good humanistic literacy, professional ethics, and innovation awareness, a spirit of craftsmanship that strives for excellence, strong employability, and sustainable development ability, and a grasp of the professional knowledge and technical skills, facing the civil engineering construction industry A professional group of construction engineering technicians in industries such as the housing construction industry, and high-quality technical and skilled personnel capable of engaging in construction and management related work. From the professional teaching standards, it can be seen that the training objectives of secondary and higher vocational talents are disjointed, and there is a lack of transitional knowledge and ability cultivation. Therefore, when formulating professional teaching standards and talent cultivation plans, it is necessary to coordinate the training objectives of secondary and higher vocational talents, and achieve a ladder improvement of knowledge and ability.

4.2 Accelerating the Construction of Teaching Resources and Promoting the Integrated Curriculum Reform

Fully mobilize various forces such as government departments, industry organizations, and cooperative universities, accelerate the construction of training bases based on talent cultivation goals and curriculum settings, hire corporate teachers, and achieve “real training” and “real courses” without “water courses”. In terms of training base construction, it is required that the school attach

importance to the construction of training bases, strictly comply with the requirements of relevant documents, and invest the funds for training construction into the construction of training bases quickly and accurately; In inter school, it is necessary to optimize the allocation of resources, establish relevant measures, promote, coordinate, and restrict the flow of resources between schools. [4] Systematically plan and design training and internship arrangements, strengthen practical teaching, coordinate the construction and utilization of various school enterprise training bases, widely carry out various social practical activities, and integrate vocational literacy training and vocational skill training throughout the entire training process. In the construction of the teaching staff, it is necessary to break down the personnel barriers between schools and enterprises, employ each other, eliminate the practice of teachers in schools monopolizing all courses, and guide enterprise teachers to impart skills appropriate to their positions to students. To optimize teaching resources, colleges and universities should jointly run enterprises, establish an integrated professional core curriculum library, develop and compile textbooks, incorporate the latest technologies, processes, and specifications into the teaching content, adhere to the integration of documentary evidence, accelerate the construction of high-quality online courses, encourage curriculum reform in the form of projects, topics, and online courses, and promote the integrated curriculum reform in secondary and higher vocational education.

4.3 Strengthen inter school communication and explore integrated teaching and research

Abandoning the past “exchange for communication” symposiums, higher vocational colleges have taken the lead in organizing teaching and research groups including secondary vocational schools and industrial enterprises, regularly organizing thematic discussions, and conducting meetings on talent cultivation standard development, talent cultivation plan formulation, curriculum system design, curriculum implementation, textbook development, skill competitions, quality evaluation, etc. as required. Teachers in secondary and higher vocational schools should regularly discuss outstanding experiences in teaching Conduct discussion and communication on teaching confusion, and do a good job of displaying outstanding classes in public. Encourage secondary and vocational school teachers to pair up and form teaching innovation teams by themselves; The Scientific Research Department should set up special project funds for the integration of secondary and higher vocational education, encourage teachers to research related topics of the integration of secondary and higher vocational education, and accelerate the promotion of integrated communication between secondary and higher vocational education.

4.4 Improve quality monitoring and improve the integrated management evaluation system

Establish an integrated quality supervision team for secondary and higher vocational colleges, including secondary and higher vocational colleges, business enterprises, parents, and students. Led by the supervision department of secondary and higher vocational colleges, the team regularly conducts process supervision on the implementation of teaching plans. In addition, the quality supervision team conducts teaching inspections for secondary and higher vocational colleges three times per semester, including but not limited to the implementation of teaching plans, student evaluation, class attendance, and class evaluation. Reform the student academic evaluation system, improve the result evaluation, strengthen the process evaluation, explore value-added evaluation, improve comprehensive evaluation, and improve the integrated student academic quality evaluation system of secondary and higher vocational education. Establish a specialized integrated enrollment and examination management organization for secondary and higher vocational education, develop an open and transparent evaluation platform for students’ academic performance and teacher teaching in secondary and higher vocational education, promote the openness of evaluation, and encourage all parties in society to conduct evaluation.

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