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Application Strategies of Integrating Theory and Practice in the Teaching of Electronic Information Major in Secondary Vocational Schools

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Abstract: ***In view of the problems such as the disconnection between theory and practice, single teaching methods and insufficient practical training resources existing in the traditional teaching mode of electronic information major in secondary vocational schools in the process of cultivating high-quality skilled talents, this paper takes the students of a certain electronic information major in secondary vocational schools as the research object and systematically explores the application strategies of integrated theory and practice teaching. The research constructs a systematic teaching implementation path from five dimensions: clarifying teaching objectives, optimizing teaching content, innovating teaching implementation models, deepening school-enterprise cooperation, and establishing an evaluation mechanism. The aim is to promote the deep integration of theoretical teaching and practical training, effectively enhance students' professional abilities and job adaptability, and provide feasible solutions for cultivating compound technical and skilled talents.***

Keywords: Integration of theory and practice; Secondary vocational education; Electronic Information major; Teaching strategies; School-enterprise cooperation.

1. INTRODUCTION

In the current era where information and intelligence are deeply integrated, the electronic information industry has become the core driving force for social progress. There is an urgent demand in the market for skilled professionals who possess both solid theoretical knowledge and outstanding practical abilities. However, the current teaching in vocational schools of electronic information still faces multiple challenges such as the separation between theory and practice, outdated methods, and scarce resources, making it difficult to effectively align with industrial upgrading and job requirements. Against this backdrop, actively exploring and implementing the integrated teaching model of theory and practice holds significant practical importance. It can break through traditional teaching barriers, optimize the curriculum structure, and effectively enhance the quality of talent cultivation.

2. THE CURRENT SITUATION OF TEACHING IN THE ELECTRONIC INFORMATION MAJOR OF SECONDARY VOCATIONAL SCHOOLS

Although the current teaching of the electronic information major in secondary vocational schools has undergone multiple reforms, it is still largely constrained by the traditional model. There are significant gaps between the overall situation and the requirements for cultivating high-quality skilled talents in several key aspects. The specific manifestations are as follows:

2.1 Disconnection Between Theory and Practice

Theoretical teaching is mostly conducted through classroom lectures, focusing on the imparting of principles and formulas. Meanwhile, practical teaching is scheduled in separate sessions, with the content often being verification-based or fixed-process operations [1]. This "first theory, then practice" linear model leads to students feeling abstract and dull during theoretical learning, and having difficulty effectively connecting theory during practice, unable to form a virtuous cycle of "theory guiding practice, and practice deepening theory".

2.2 Single Teaching Mode

Classroom teaching is still centered around the teacher, with the "lecture by the teacher and listening by the students" model dominating. Whether it is a theoretical class or a practical class, students are mostly in a passive receiving or mechanical imitation state [2]. The teaching methods lack diversity and there is insufficient classroom interaction, which is not conducive to stimulating students' learning initiative and comprehensive problem-solving abilities.

2.3 Insufficient Support for Practical Training Conditions

Many secondary vocational schools are confronted with problems such as insufficient quantity of training equipment, outdated models, and lagging technology compared to the development of the industry. The limited training resources are unable to meet the full hands-on operation needs of all students, and some advanced training projects for technologies cannot be effectively carried out [3]. At the same time, the failure to update equipment in a timely manner also restricts the normal conduct of training teaching and the improvement of students' practical abilities.

2.4 Imbalance in the Structure of the Teaching Staff

The professional teaching team generally shows a tendency of "strong theory but weak practice". Many teachers graduated from ordinary universities and have a solid theoretical foundation, but they lack practical work experience in information and electronic technology-related enterprises. They have limited understanding of the latest technical standards, production processes, and job requirements in the industry, and are unable to integrate real cases and engineering experience into teaching, resulting in "paper-based" practical guidance [2]. At the same time, teachers have limited opportunities for practical training, and their own knowledge and skills cannot keep up with the pace of industrial development, which affects teaching quality [1].

3. THE CONNOTATION OF INTEGRATED THEORY-PRACTICE TEACHING AND ITS APPLICATION VALUE IN THE TEACHING OF INFORMATION TECHNOLOGY MAJOR IN SECONDARY VOCATIONAL SCHOOLS

3.1 The Connotation of the Integration of Theory and Practice

The integration of theory and practice in teaching, which combines theoretical learning with practical operations, is an important direction of modern educational reform. Under this concept, theoretical knowledge and practical skills are no longer separate entities but rather a unified whole that mutually promote and support each other: Theoretical teaching no longer merely focuses on the transmission of knowledge but is closely linked with practice, effectively guiding practical operations; The practical part is not merely skill training but also the application, verification and deepening of theoretical knowledge. The integration of theory and practice in teaching emphasizes the subjectivity of students, encouraging them to actively participate and explore, aiming to cultivate students' innovative spirit and practical abilities [4].

3.2 Application Value

3.2.1 Highlight the student's dominant position and stimulate their learning interest

The integrated theory-practice teaching method breaks the traditional passive mode of "teacher lecturing and students listening", and returns the initiative of the classroom to the students. Students are no longer passive recipients of knowledge; instead, they are active constructors who "learn by doing" and "do while learning" in real tasks, project practices, and group collaborations. This teaching method closely combines abstract theories with vivid practices, making the learning content intuitive and tangible, which can greatly stimulate students' curiosity and intrinsic motivation. When students complete tasks such as circuit debugging and equipment installation by hands-on practice, they not only experience the sense of achievement from applying what they have learned, but also can continuously maintain their learning enthusiasm through teamwork and exploration, thus truly becoming the main body of learning.

3.2.2 Deepen the understanding of theoretical knowledge and enhance learning effectiveness

Many concepts and principles in the electronic information major, such as circuit analysis and signal processing, are often quite abstract. Pure theoretical teaching may make students feel dull and difficult to understand. The integrated theory-practice teaching method verifies the theory through practical operations, making the abstract knowledge more concrete. Students observe phenomena and verify laws during experiments and practical training, which enables them to deeply understand the connotation and application conditions of the theory, promoting the transformation of knowledge from surface memory to deep understanding. This "theory guiding practice, practice deepening theory" cycle can help students build a systematic and coherent knowledge system, and improve learning efficiency and quality.

3.2.3 Strengthen the cultivation of practical abilities and shorten the job adaptation period

The integrated theory-practice teaching focuses on the cultivation of vocational abilities, emphasizing the training of students' practical skills and the ability to solve practical problems. The courses are designed around typical work tasks, closely related to the real production processes of enterprises, enabling students to accumulate practical experience such as equipment operation, fault diagnosis, and project collaboration during their studies. This not only significantly improves students' professional practical skills and comprehensive vocational qualities, but also significantly shortens their adaptation time after graduation. Students can reach the employer's standards more quickly and achieve seamless transition from school to the workplace, thereby enhancing their employment competitiveness and also providing the industry with ready-to-use and innovative technical and skilled talents.

4. APPLICATION STRATEGIES OF INTEGRATED THEORY-PRACTICE TEACHING IN VOCATIONAL EDUCATION OF ELECTRONIC INFORMATION TECHNOLOGY

4.1 Research Approach

This research aims to enhance the job adaptability and comprehensive vocational abilities of vocational education students majoring in electronic information technology. It systematically constructs the implementation path of integrated theory-practice teaching. Firstly, based on industry research, the requirements for job capabilities are clarified, and three-dimensional integration of knowledge, skills, and qualities is established as the teaching goal. On this basis, the course content is reorganized, and theoretical knowledge points are embedded in typical work tasks to promote the two-way cycle of "learning by doing and doing by learning". At the teaching implementation level, project-driven and scenario simulation methods are comprehensively utilized to enhance students' practical abilities in real or simulated environments. At the same time, relying on the school-enterprise collaboration mechanism, enterprise resources and evaluation standards are introduced to build a "teaching - practice - evaluation" closed loop, continuously optimizing the teaching process, and effectively enhancing the effectiveness and specificity of talent cultivation. The specific research approach is shown in Figure 1.

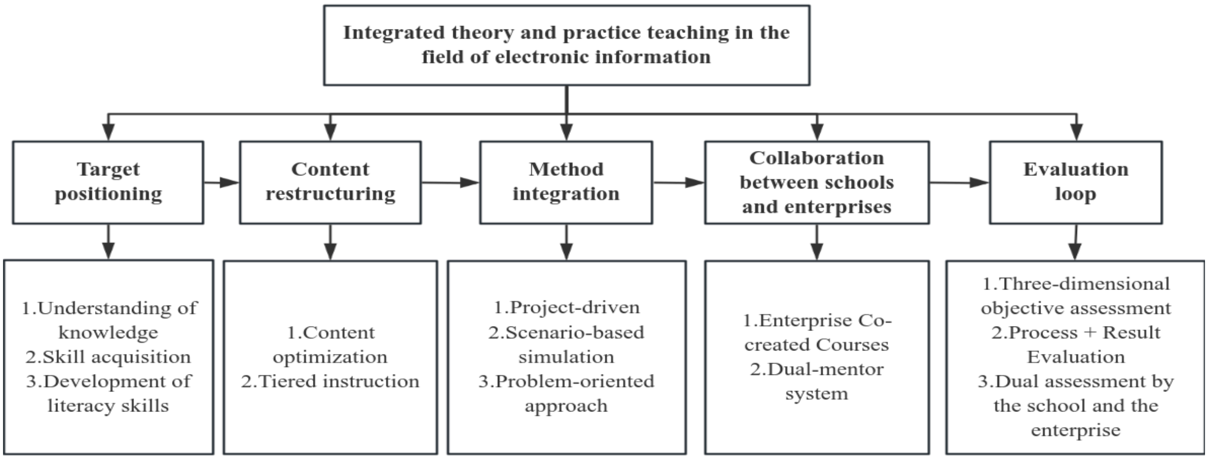

Figure 1: Implementation Pathway of Integrated Theory-Practice Teaching System

4.2 Application Strategy

4.2.1 Clearly define the integrated teaching objectives of theory and practice

The establishment of teaching objectives is the initial step in implementing integrated theory and practice teaching. Teachers should base their efforts on professional competence as the core, and according to the actual ability requirements of industry and enterprise positions, with reference to national professional teaching standards and vocational skill level standards, construct a clear hierarchical and distinct goal system that promotes the interaction between theory and practice, so as to truly implement the teaching concept of combining learning with application and integrating knowledge with action [5].

Specifically, the setting of teaching objectives should systematically cover three dimensions: knowledge, skills, and qualities. It should form an integrated whole. The knowledge objective focuses on the mastery of core theoretical content, providing necessary theoretical support for practical application; the skills objective focuses on the cultivation of practical operation ability, highlighting the training in solving practical problems in real or simulated working scenarios; the quality objective emphasizes the cultivation of comprehensive professional qualities such as professional attitude, engineering thinking, teamwork, and innovation awareness, laying the foundation for students to adapt to changes in positions and achieve sustainable career development. During the design process, teachers should, based on the development trends of the industry and the evolution of technology, timely integrate cutting-edge content such as intelligent hardware and IoT applications into the goal system. At the same time, in combination with students' cognitive characteristics and development potential, they should finely decompose and correspondally connect theoretical modules and practical projects to ensure that each goal has a specific teaching carrier and evaluation basis. Through goal-oriented project introduction, task-driven, and outcome presentation, teachers can guide students to gradually achieve each stage of goals through "learning by doing and doing by learning", thereby achieving the teaching effect of mutual promotion of theory and practice and progressive improvement of abilities.

4.2.2 Optimize the teaching content of the integrated theory-practice approach

The optimization of teaching content is the core for achieving the deep integration of theory and practice. The key lies in breaking through the barriers of traditional disciplinary systems and using typical work tasks or projects as carriers to organically embed theoretical knowledge into the practical aspects [6]. Firstly, the existing course content should be restructured, eliminating outdated and redundant content, and promptly supplementing theoretical knowledge reflecting new industry achievements to ensure that the course system keeps pace with the cutting-edge of technological development [5]. Secondly, in terms of teaching methods, emphasis should be placed on the interweaving of theoretical lectures and practical demonstrations. For example, in the teaching of "JK Flip-Flop", it can be designed as a two-section linked course of "theoretical explanation + implementation of the four-person buzzer project". In the theoretical class, the logical functions and pin definitions are clarified; in the practical class, students are grouped to complete circuit assembly and debugging, enabling them to deepen their understanding through hands-on practice. Figure 2 clearly shows the design and implementation process of such teaching content, vividly illustrating the organic connection of each link from "theory - demonstration - practice - reflection". Teachers can provide targeted guidance based on the common problems exposed in students' practice (such as incorrect circuit connections, program logic flaws), thereby achieving "learning by doing and doing by learning". Moreover, considering the differences in students' foundations and abilities, the teaching content should also be designed in a hierarchical manner： the basic level focuses on circuit assembly and basic debugging, while the advanced level adds tasks of program optimization and function expansion. Through differentiated practical arrangements, students of different levels can solidly master theory and skills, and comprehensively improve learning effectiveness.

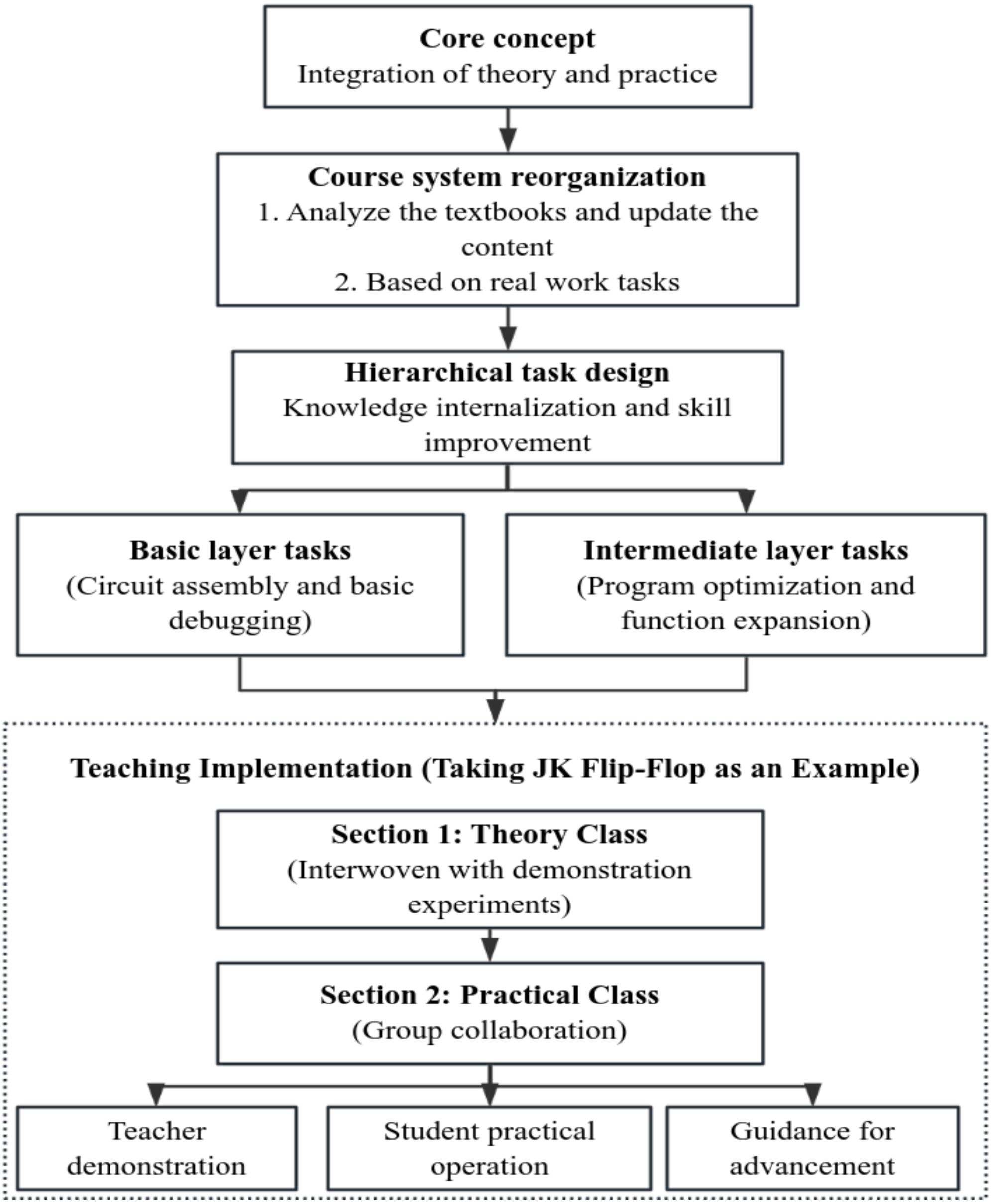

Figure 2: Flowchart of Integrated Teaching Design for JK Flip-Flop Theory and Practice

4.2.3 Adopt diversified teaching implementation models

To achieve the deep integration of theory and practice, it is necessary to comprehensively apply various teaching models to form a teaching system with complementary methods and progressive levels. The following three models have significant value in practice.

1) Project-driven teaching

Project-driven teaching is the core teaching method suitable for the electronic information major, which can effectively connect professional skills training needs and enhance students' practical application and teamwork abilities. In teaching implementation, teachers should closely combine students' knowledge foundation, hands-on ability, and interest characteristics, scientifically design projects that are practical for the job position, reasonably control the difficulty gradient of tasks, and ensure that the teaching content is both targeted and feasible [1]. For example, projects such as three-person voting device and 555 alarm circuit can be selected to guide students to actively apply digital logic and sensor protocols in the process of completing circuit design, programming debugging, etc. During the teaching process, teachers need to track the progress of each group in real time, accurately record common problems such as welding techniques, program debugging, and circuit compatibility, and through centralized explanations and personalized guidance, help students break through bottlenecks and enable them to continuously deepen their understanding and mastery of professional knowledge in the closed-loop teaching of "learning by doing and doing by learning", achieving the integration of theory and practice.

2) Situational simulation teaching

Situational simulation teaching helps students familiarize themselves with and adapt to the requirements of professional positions by constructing highly realistic working scenarios, and is a key carrier for connecting classroom teaching and workplace practice [5]. In the electronic information major, teachers should design realistic situational tasks that are in line with the actual job position based on industry production processes and service norms, such as "real operation of electronic product production line quality inspection position" and "on-site handling of smart home system installation and debugging" etc. In teaching implementation, teachers should create a realistic job atmosphere, such as appropriately setting abnormal component parameters and equipment connection failures as work obstacles, guiding students to actively think about solutions, and through collaboration to overcome task difficulties. At the same time, a role division mechanism should be introduced, allowing students to take turns playing the roles of process technicians, test engineers, and project coordinators, through hands-on experience of each job position, deeply understand the team collaboration process and industry norms requirements, and comprehensively shape students' professional identity, job responsibility, and comprehensive adaptability.

3) Problem-oriented teaching

Problem-oriented teaching is led by actual problems in the field of electronic information, which can guide students to gradually develop autonomous learning habits, improve active thinking abilities, and develop comprehensive practical skills, and is a key path for cultivating the innovative thinking and inquiry ability of secondary vocational students in the electronic information major [5]. In teaching implementation, teachers should closely combine the core knowledge points of the major and the actual difficulties of industry positions, based on the training goals of vocational education, set core questions that are open-ended, exploratory, and practical, such as "how to optimize sensor data acquisition accuracy to improve monitoring stability" and "how to achieve low-power operation of IoT devices through technical improvement". On this basis, teachers should guide students to independently explore solutions from multiple dimensions such as hardware selection, circuit design, and program optimization, and encourage students to continuously iterate and optimize solutions through literature research, simulation verification, and prototype testing. At the same time, the role of the teacher needs to undergo a fundamental transformation, gradually shifting from a traditional knowledge transmitter and problem proposer to a guide of exploration activities, a thinker's inspirer, and a promoter of learning activities. Specifically, teachers can use timely questioning and targeted thinking guidance to help students discover and generate new problems during the exploration process. Furthermore, in the teaching process, teachers should also follow the principle of differentiation. Teachers need to dynamically adjust the difficulty gradient and support level of tasks according to the cognitive progress and practical abilities of students at different levels, so that every student can achieve corresponding growth and a sense of accomplishment during the problem-solving process, and truly implement individualized teaching.

4.2.4 Deepening School-Enterprise Cooperation

Deepening school-enterprise cooperation is an important guarantee for ensuring the close alignment of practical teaching with industrial demands. Vocational schools should actively establish long-term and stable cooperative relationships with high-quality enterprises in the industry, jointly participate in the formulation of talent training plans and the development of course resources, thereby forming a positive mechanism for collaborative education.

Specifically, schools should first establish a regular communication mechanism, conduct regular exchanges and interactions with enterprises, promptly grasp the development trends of industry technologies and new requirements for job capabilities, and dynamically optimize the course content and teaching methods accordingly. For example, they can invite technical experts from enterprises to enter the classroom, through sharing real project cases, demonstrations of practical skills, etc., to teach students the first-line work processes, technical norms, and problem-solving skills, effectively enhancing the timeliness and relevance of teaching content. On this basis, schools should organize students to enter enterprises for on-the-job internships in stages and in a planned manner according to students' cognitive laws and learning progress. During the internship period, students can deeply participate in real work processes such as electronic component testing, electronic equipment assembly and debugging, and regularly write internship reports and reflection notes; schools should also assign full-time teachers to provide follow-up guidance and promptly assist students in solving problems encountered in practice, ensuring that the internship effect is implemented. At the same time, the "dual-mentor" system between the school and the enterprise should be fully implemented. On one hand, arrange school teachers to regularly go to enterprises for practical learning to update their technical knowledge reserves; on the other hand, hire enterprise technicians as off-campus mentors to provide on-site practical guidance and technical answers [7]. Schools can, based on the internship feedback from enterprises to students, specifically strengthen students' weak links and dynamically adjust the relevant course settings and teaching strategies, forming a two-way interactive improvement cycle. Finally, incorporate students' internship performance and results into the comprehensive evaluation system and establish an effective incentive and feedback mechanism to guide students to attach importance to the improvement of practical abilities and professional qualities. Through the above multi-stage, systematic school-enterprise collaborative training, ultimately achieve high-quality matching between talent output and industrial demands.

4.2.5 Establish a practical-integrated assessment mechanism

A scientific and effective assessment mechanism is an important guarantee for evaluating the effectiveness of practical-integrated teaching and promoting its improvement [8]. The assessment should abandon the sole reliance on final written tests and build a diversified and process-based evaluation system. This system should cover multiple dimensions such as knowledge comprehension, skill operation and professional quality, and run through the entire teaching process.

Table 1: In-School Teacher Evaluation Form

Evaluation Categories	Evaluation Items		Scoring Criteria	Score
Formative Evaluation	if the attendance rate is 30%,	Attendance Rate	Full attendance 10 points, one absence deduct 2 points	
		Classroom Interaction	Active (8-10 points), Average (5-7 points), Less (0-4 points)	
		Homework	A grade 10 points, B grade 8 points, C grade 6 points, D grade 4 points	
	Experimental Operation 40%	Clarity of experimental purpose 3 points Understanding of experimental principles 8 points Standardness of instrument operation 3 points Record of experimental data 10 points Writing of experimental report 10 points Independence in completing experiments 3 points Analysis and discussion of problems 3 points		
Summative Evaluation	Final Examination 30%	Percentage-based written test results	30% weight based on the paper score	

Since the integrated theory-practice teaching aims to connect school education with job requirements, in the evaluation process, it is necessary to combine the dual perspectives of school teachers and enterprise mentors to comprehensively assess students' theoretical foundation and practical ability. As shown in Table 1, the evaluation by school teachers can focus on students' mastery of theoretical learning, the standardization of experimental operations, and report writing, ensuring that students have a solid professional foundation.

However, to truly measure students' adaptability to the job and their technical application level, it is necessary to introduce enterprise evaluation standards. Therefore, as shown in Table 2, enterprise mentors will, based on the actual job requirements, focus on evaluating students' skill application, problem-solving ability, and professional behavior performance in real or simulated environments.

Table 2: Enterprise Mentor Evaluation Form

Evaluation Categories	Evaluation Items	Scoring Criteria		
		Excellent	Good	Poor

Formative Evaluation	Performance during practical training 20%	Standardization of operation procedures 8 points Compliance with process standards 7 points Safety operation awareness 5 points
	Project progress evaluation 20%	Rationality of project plan design 10 points Completion of stage tasks 10 points
Summative Evaluation	Comprehensive ability assessment 60%	Skill practical operation assessment 30 points Project work evaluation 20 points Comprehensive presentation performance 10 points
Formative Evaluation	Professional quality evaluation (additional 10 points)	Teamwork ability Responsibility awareness and craftsmanship spirit

Through this combined approach of internal and external evaluations, emphasizing both process and outcome, it is possible to objectively and comprehensively reflect students' comprehensive vocational abilities, and provide precise basis for teaching feedback and improvement. Eventually, a virtuous cycle of "evaluating to promote learning and evaluating to promote teaching" can be formed, ensuring seamless alignment between talent cultivation and industry demands.

5. CONCLUSION

The reform of integrating theory and practice in vocational education for information technology majors is an inevitable choice for this field to adapt to technological development and industrial upgrading. The above strategies, by systematically promoting the deep integration of theoretical teaching and practical training, can effectively enhance students' comprehensive vocational abilities and job adaptability. In the future, it is necessary to continuously deepen school-enterprise cooperation, strengthen teacher training, and improve supporting conditions, so that the integrated theory and practice teaching can truly take root and thrive, and provide more outstanding applied technical and skilled talents for the information technology industry.

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