

A Brand New Applied Higher Education Model Exploration and Informatization of "Zhong Ben Yi Ti Hua"

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Abstract

"Zhong Ben Yi Ti Hua"(ZBYTH) that is an innovative integration of secondary and bachelor education, it refers to a novel educational model that combines three years of secondary vocational education with four years of applied undergraduate education, forming a seamless seven-year program. This paper delves into the development process of the "ZBYTH" project at Zhejiang University of Science and Technology, detailing the specifics of its training system. Based on this analysis, we propose targeted improvement suggestions tailored to practical conditions. We also describe the concrete measures the university adopted through educational informatization, and the outcomes and impacts of these implementations. By thoroughly analyzing this process, the paper aims to provide valuable insights and references for the optimization and enhancement of similar future projects.

Keywords: Innovative educational model combining seven years; educational informatization; ZBYTH; Higher Education; vocational technical education; Education and training model.

1. Introduction

Since China joined the World Trade Organization (WTO), its economy and military have achieved remarkable progress. Not only has its Gross Domestic Product (GDP) risen to the second-largest in the world, but its military strength has also significantly increased, effectively making China one of the global power poles. This rise has inevitably drawn extensive attention from the international community, especially from the United States, which has become strategically alert. In this new era of simultaneous competition and cooperation between China and the U.S., how to steadily maintain the current development trajectory and promote higher-quality and more sustainable development has become a major issue and an urgent task for China.

The prosperity and strength of a nation are deeply rooted in a solid industrial and manufacturing foundation. The emergence of highly skilled talent is the key driving force for the transformation and upgrading of the manufacturing industry towards higher-end development. In the new journey of building a modern socialist country in all respects, the importance of vocational education is increasingly prominent. It serves not only as a bridge connecting education and industry but also as a crucial cornerstone for nurturing future craftsmen and empowering industrial upgrading (see [1-3]).

To actively respond to the national demand for high-quality technical and skilled personnel, China is promoting the high-quality development of vocational education with unprecedented efforts, striving to inject strong impetus into economic and social development through educational innovation. The "ZBYTH" training model emerged as an innovative initiative in this context. It ingeniously integrates the advantages of secondary vocational education and undergraduate education, creating a seamless transition from skill training to theoretical deepening, with the goal of cultivating high-quality, compound technical talents who possess both solid professional skills and broad

knowledge perspectives. This initiative also emphasizes the extensive use of educational informatization to better train such talents.

Specifically, the "ZBYTH" model refers to an integrated design that combines secondary vocational education and undergraduate education into a seven-year continuous education system. In this system, the secondary vocational education phase lasts for three years, during which students receive professional skill training in vocational high schools. The undergraduate phase lasts for four years, where students undertake in-depth learning of theoretical knowledge and practical skills at universities. This model aims to cultivate applied high-skilled talents with good professional qualities, professional knowledge, and professional capabilities through continuous learning in both the secondary vocational and undergraduate phases. After completing the three-year secondary vocational education, students do not need to take the traditional college entrance examination or the specialized upgrade examination but can directly enter undergraduate institutions for four years of study by passing a 100% pass rate exam. This model expects students to master comprehensive process operation and supervision capabilities through systematic theoretical knowledge learning and technical training, thereby achieving a smooth connection between vocational education and general higher education.

Currently, this education method has been implemented in most provinces across the country. In many province of China, this education method is known as "Zhong Ben Guan Tong (ZBGT)." In Zhejiang Province, it is called "ZBYTH" (see [4-14] and so on).

The modern vocational education system aims to closely meet the needs of local economic and social development by establishing an organically connected system that covers secondary vocational education, specialized education, undergraduate education, and even postgraduate education levels. It also promotes the deep integration and intercommunication between vocational education, general education, and continuing education, forming a comprehensive and multi-level modern vocational education system. The core of constructing this system is to strengthen the "connection of vocational education" to ensure the continuity and progression of educational content at each stage.

Currently, vocational and technical education from secondary vocational to junior college level, although playing an important role in cultivating skilled talents, still falls short of the skill levels and comprehensive qualities required by modern development needs. Historical experience shows that the rise of Germany in the 19th century was inseparable from its highly qualified vocational technical workforce. With technological advancements and industrial upgrades, especially the increasing digitalization and intelligence of industrial equipment, higher requirements are placed on the professional skills and knowledge reserves of practitioners. Numerous high-precision, high-tech production tools require users to undergo long-term, systematic training and learning to operate proficiently and efficiently ([1,2], [15-17]).

Educational informatization is a comprehensive and in-depth process that runs through the refinement of educational management, the innovation of education and teaching, and the forefront of educational research. By extensively adopting modern information technology, it accelerates the reform and modernization of the education system. Its significant technical features are manifested in the wide application of digital technology, seamless network architecture, deep integration of intelligent systems, and rich presentation of multimedia resources. These technical features collectively construct the basic appearance of educational informatization, which is open, inclusive, resource-sharing, instant interaction, and collaborative cooperation.

Educational informatization is not only a technological innovation but also a key force leveraging the transformation of traditional education models into modern ones. It challenges and reshapes existing educational thinking, concepts, models, content, and teaching methods, leading to a profound educational transformation. In this transformation, educational informatization not only serves as an important part of the national informatization strategy but also bears the significant mission of transforming educational concepts, deepening educational reforms, and enhancing educational quality and efficiency, and nurturing innovative talents.

Therefore, in the face of the unprecedented demand for high-end skilled talents driven by the new era of economic and social development, promoting vocational education to higher levels and focusing on cultivating vocational technical personnel with undergraduate or higher degrees has become an urgent task. This strategic move aims to

fundamentally address the depth and breadth limitations in the knowledge system construction of current skilled talents, ensuring that they can not only proficiently master professional skills but also possess a solid theoretical foundation and broad vision.

This initiative is of far-reaching significance. It will provide a solid talent foundation for the precise operation and efficient maintenance of high-precision equipment, becoming a key force in promoting the transformation, upgrading, and high-quality development of China's manufacturing industry and related industries. Through the deep integration of educational informatization methods, we can further optimize teaching models, promote the open sharing and efficient utilization of educational resources, and equip vocational technical personnel with technological wings.

Educational informatization will help construct more flexible and diverse learning pathways, utilizing the advantages of digitalization, networking, intelligence, and multimedia to break time and space constraints and provide personalized learning experiences. This will not only stimulate students' learning interest and potential but also effectively enhance teaching quality and efficiency, ensuring that every learner can grow into high-end skilled talents meeting the requirements of the new era through the dual tempering of knowledge and practice.

This paper will take Zhejiang University of Science and Technology as an example to deeply study the advantages and disadvantages of the "ZBYTH" education method, the students' learning conditions, and the specific measures and outcomes achieved by the school through educational informatization in response to these conditions.

2. Development of the Project

According to document ZJEBH [2018] No. 142: "Notice of the Zhejiang Provincial Department of Education Office on the Admission Work of the 2018 Zhejiang Province Secondary Vocational and Applied Undergraduate Integrated Talent Training Pilot Project," Zhejiang Province started the enrollment work of the "ZBYTH" project for the first time in 2018. The enrollment situation of the project evolved from initial confusion to eventually becoming extremely popular.

The enrollment of "ZBYTH" mainly targets fresh junior high school graduates who meet the various high school enrollment conditions, with some schools also accepting previous graduates. These candidates need to participate in the local high school entrance examination in their respective prefecture-level cities and choose the "ZBYTH" major through the voluntary filling system, being selected based on their entrance examination scores. The admission work is usually completed before other batches of admissions.

As an important measure of educational reform, the "ZBYTH" project has carried the expectations of promoting the integration of vocational education and general education and improving the quality of skilled talent training since its first enrollment in 2018. However, due to the initial information asymmetry and unfamiliar policies, the enrollment work faced significant resistance, specifically reflected in the notably low admission scores.

In 2018, as the inaugural year of the "ZBYTH" project, the general public held a wait-and-see attitude towards this emerging educational model. Due to a lack of deep understanding and sufficient information dissemination, parents and students had significant misgivings about the project, leading to a noticeable cautious sentiment during the enrollment process. This psychological reflection was evident in the year's admission scores, especially in majors such as mechanical and intelligent manufacturing, where the lowest admission scores were close to or below the minimum standard of ordinary vocational high school majors, highlighting the initial enrollment difficulties of the project.

Since 2019, with the national emphasis on vocational and technical education further increasing, a series of promotional measures have been introduced to enhance the understanding and awareness of the project among the public. After more than a year of unremitting efforts, the advantages and characteristics of the "ZBYTH" project have gradually become well-known among teachers, students, and parents, and its educational value and social significance have been widely recognized. This change was directly reflected in the admission scores in subsequent years. The admission scores of the "ZBYTH" project began to rise significantly, gradually surpassing the admission scores of ordinary high schools.

Table 1 Minimum Admission Scores of Some Ordinary High Schools in Hangzhou (2019-2024)

School Name	2019	2020	2021	2022	2023	2024
Hangzhou No.2 High School (Binjiang Campus)	565	540	585	585	575	623
Hangzhou Xuejun High School (Xixi Campus)	561	538	584	584	573	622
Hangzhou High School (Gongyuan Campus)	556	533	583	582	570	619
Hangzhou No.14 High School (Fengqi Campus)	552	530	581	580	567	617
Hangzhou No.4 High School (Xiasha Campus)	549	524	577	576	566	616
Xiaoshan High School (Urban Area Enrollment)	549	521	578	577	565	615
High School Affiliated to Zhejiang University (Yuquan Campus)	542	520	577	576	565	614
Yuhang High School (Urban Area Enrollment)	541	518	576	575	564	613
Hangzhou Xuejun High School (Zijingang Campus)	538	514	576	574	564	612
High School Affiliated to Hangzhou Normal University	538	514	575	573	561	611
Fuyang High School (Urban Area Enrollment)	536	512	572	571	560	611
Hangzhou Changhe High School	532	510	572	571	558	609
Hangzhou High School (Qianjiang Campus)	529	507	570	568	558	608
Hangzhou No.2 High School Qianjiang School	520	504	568	566	555	606
Hangzhou No.14 High School (Kangqiao Campus)	519	497	567	565	555	606
Hangzhou Yuanqing High School	518	495	561	564	554	604
High School Affiliated to Zhejiang University (Dinglan Campus)	515	494	560	560	552	604
Xuejun High School Haichuangyuan School	514	493	559	557	551	603
Lin'an High School	511	492	557	556	549	602
Yuhang No.2 High School (Urban Area Enrollment)	509	491	554	556	549	600
Hangzhou No.7 High School	505	490	553	554	545	598
Hangzhou West Lake High School	505	486	553	553	544	597
Xiaoshan No.5 High School (Urban Area Enrollment)	500	483	549	552	544	596
Hangzhou No.4 High School (Wushan Campus)	496	481	549	551	544	596
Fuyang No.2 High School (Urban Area Enrollment)	496	478	548	550	543	594
Hangzhou No.2 High School (Donghe Campus)	494	478	544	549	540	593
Hangzhou Lvcheng Yuhua School	491	478	544	548	538	589
Hangzhou No.9 High School	489	473	543	546	537	589
Hangzhou Xiayan High School	488	473	540	545	535	589
Hangzhou No.11 High School	480	472	539	543	535	587
Hangzhou Changzheng High School	478	471	536	542	534	586
Hangzhou No.2 High School Donghe Campus Media Arts Special Class	478	465	535	536	531	586
Hangzhou No.7 High School Art Special Class	473	464	533	536	530	585
West Lake High School Art Special Class	462	462	532	534	530	583
Hangzhou Genshan High School	471	460	530	534	527	583
Xiaoshan No.9 High School	471	454	527	531	526	583
Hangzhou No.11 High School Desheng Campus	-	-	-	530	524	582
Hangzhou Xiayan High School	-	-	-	530	523	578
Hangzhou No.2 High School Donghe Campus Chuanbao Art Special Class	-	-	-	528	519	578
Hangzhou Fangsihu High School Art Special Class	-	-	-	521	517	577
Hangzhou No.11 High School Daguan Campus	-	-	-	511	516	576
Hangzhou Changzheng High School	-	-	-	530	515	571
Hangzhou Qiantang High School	-	-	-	528	513	570
Hangzhou Lvcheng Yuhua School	-	-	-	-	511	570
Hangzhou Genshan High School	-	-	-	-	511	570
Lin'an Tianmu High School	-	-	-	-	511	568
Hangzhou Qiantang High School Art Special Class	-	-	-	503	503	568

Hangzhou No.7 High School Jiefang Road Campus Art Special Class	-		-	500	500	568
Lin'an Tianmu High School	-	-	-	-	-	568
Hangzhou Qiantang High School Art Special Class	-	-	-	-	-	563

Due to the lack of data in some years, "-" is used in the table, with bolded fonts schools representing key high schools in Zhejiang Province.

Table 2 Minimum to Maximum Admission Scores of the Digital Media "ZBYTH" Major at Hangzhou Electronic Information Vocational School (2019-2024)

Year	2019	2020	2021	2022	2023	2024
Highest Admission Score	526	508	577	562	564	607
Lowest Admission Score	489	467	531	535	531	590

For instance, in the recent 2024 Hangzhou high school entrance examination admissions, the highest admission score for a certain "ZBYTH" major at Zhejiang Normal University reached 623 points. This score not only far exceeded the historical admission scores of the project but also was on par with the highest admission scores of key high schools in Hangzhou that year. This case fully demonstrates the remarkable achievements of the "ZBYTH" project in the education field and its significant position in the minds of students and parents. It is noteworthy that despite the score being sufficient to enter any high school in Hangzhou, the candidates still firmly chose the "ZBYTH" project, further validating the project's positive role in enhancing the attractiveness of vocational education and promoting educational equity and diversity.

Tables 1 and 2 below take the Digital Media "ZBYTH" major as an example. This major is recruited by Hangzhou Electronic Information Vocational School and provides secondary vocational education to students, while the university stage education is provided by Zhejiang University of Science and Technology.

From the detailed data in Tables 1 and 2, we can clearly observe the competitive situation of the Digital Media "ZBYTH" major, with its minimum admission scores consistently maintaining and surpassing the average admission scores of ordinary high schools in Hangzhou. Specifically:

In 2019, the admission score range for this major was 489 to 526 points. The highest score was only 3 points away from the minimum admission score of Hangzhou Senior High School Qianjiang Campus, a key high school in Hangzhou, highlighting its high competitiveness.

In 2020, the highest admission score for this major jumped to 526 points, officially surpassing the minimum admission line of Hangzhou Senior High School Qianjiang Campus, marking a significant improvement in its recognition in the education market.

In 2021, the highest admission score climbed to 577 points, exceeding 53% of key high schools in Hangzhou, further solidifying its position in the high-end education field.

In 2022, although the highest admission score slightly retreated to 562 points, it still maintained a leading edge over most ordinary high schools and narrowed the gap with Hangzhou Senior High School Qianjiang Campus to only 6 points, making the competition more intense.

In 2023, this major achieved another outstanding performance with the highest admission score reaching and surpassing the score line of the Xiasha Campus of Hangzhou No. 4 High School, while also surpassing 46% of key high schools in Hangzhou, demonstrating a dual leap in educational quality and social recognition.

By 2024, the highest admission score of the Digital Media "ZBYTH" major at this school climbed to 607 points. This score was only 16 points away from the highest admission score of Hangzhou No. 2 High School Binjiang Campus, fully proving the excellent effect of this major in cultivating high-quality skilled talents and its extensive social impact.

In 2024, Zhejiang University of Science and Technology had four "ZBYTH" majors in Hangzhou, in cooperation with four vocational technical schools. Their admission scores are shown in Table 3.

Table 3 Admission Scores of Four Hangzhou Vocational High Schools Cooperating with Zhejiang University of Science and Technology

Educational Institution	Minimum Admission Score	Maximum Admission Score
Hangzhou Electronics & Information Vocational School	590	607
Hangzhou Zhongce Vocational School	587	614
Hangzhou Linping Vocational High School	585	611
West Lake Vocational High School	582	593

In 2024, the municipal control line for the admission scores of key high schools in Hangzhou was set at 608 points. By comparing the data in Tables 1 and 3, we can clearly observe the outstanding performance of the four vocational high schools in Hangzhou that cooperated with Zhejiang University of Science and Technology in terms of admission scores.

Notably, among these four vocational schools, two schools' highest admission scores successfully surpassed the threshold for key high schools in Hangzhou. Particularly noteworthy is Hangzhou Zhongce Vocational School, whose highest admission score reached 614 points. This achievement not only highlights the attractiveness of the project but also indicates that its admission difficulty has surpassed approximately 53% of key high schools in Hangzhou, becoming a popular choice for many students.

At the same time, Hangzhou Electronic Information Vocational School also showed strong competitive strength, with its highest admission score closely approaching the lowest control line of key high schools in Hangzhou, fully proving the school's outstanding achievements and broad recognition in the field of vocational education.

In stark contrast to the above two schools is Xihu Vocational High School. As a school that started enrolling students for the integrated secondary and undergraduate project for the first time this year, Xihu Vocational High School showed relatively insufficient popularity and attractiveness, leading to relatively few applicants and affecting its admission scores. Despite this, it also provides broad space and possibilities for the school to enhance its brand influence and attract more excellent students in the future.

3. Specific Conditions of the Project at the University

Zhejiang University of Science and Technology has been receiving students from the "ZBYTH" project for three years since 2021. Initially unfamiliar with the program, the university has now accumulated substantial experience. Over three academic years, it has become evident that while these students exhibit exceptional hands-on practical abilities and a solid foundation in vocational skills, they also show significant academic shortcomings that cannot be overlooked.

3.1 Problem One: Lack of Student Self-Motivation and Need for Enhanced Learning Enthusiasm

The "ZBYTH" project recruits students through the secondary school entrance examination, targeting candidates from the entire prefecture-level city (generally the city where the school is located). For example, the Digital Media major at Zhejiang University of Science and Technology recruits students from two vocational technical schools, one of which is Ningbo Vocational Education Center School. These students may come from various parts of Ningbo, including urban areas and counties like Yuyao and Cixi. This wide geographic distribution means that students must leave their homes and board at a distant school when they begin high school, at ages 15-18.

At this young age, students are often immature and lack a clear plan for their future. With no parental supervision and the knowledge that passing a specific, low-difficulty entrance examination unique to "ZBYTH" is their only hurdle, many students lack motivation and fail to manage their time effectively. This exam, designed specifically for "ZBYTH" students, is known to have a 100% pass rate, making it easy for students to enter undergraduate programs without the pressure of traditional entrance exams. Consequently, students often fail to maintain rigorous academic and personal standards during their high school years.

Upon entering university, while their attendance and discipline are commendable, they face less strict management compared to high school. For instance, university dormitories do not enforce lights-out times or internet restrictions, and as they are already adults, the national regulations limiting internet games use for minors no

longer apply. As a result, many students with weak willpower play games late into the night, leading to inattentiveness in classes the following day, which hinders their academic progress.

3.2 Problem Two: Strong Hands-On Abilities

Students in this project demonstrate strong practical skills developed during their secondary vocational education, which is a significant advantage. Particularly at Zhejiang University of Science and Technology, known for its engineering programs, students show great interest and proficiency in practical tasks such as metalworking and machine operation. Some even convert their personal desks into creative workspaces. This hands-on spirit contrasts sharply with ordinary high school students and is a valuable asset provided by vocational education. How to effectively harnessing and enhancing this advantage is a crucial educational challenge.

3.3 Problem Three: Need to Adjust University Mathematics Course Timings and Difficulty Levels

In September 2021, the "ZBYTH" students began their university studies. As it was the first year, the university was unfamiliar with the students' academic levels and had not yet established a communication mechanism with the vocational schools. This led to some majors choosing overly challenging mathematics courses. For example, in the 2021-2022 academic year, the Automation and Electrical Engineering College offered The most difficult level of Advanced Mathematics A+ (6+5 class hours) for majors such as Building Electrical and Automation, and Digital Media Technology opted for Advanced Mathematics A (6+4 class hours). These courses, rated as the highest difficulty by the university's curriculum plan, proved too challenging for many students.

In English, Zhejiang University of Science and Technology traditionally allocates all students to classes based on their entrance exam scores. The "ZBYTH" students attend these classes with the entire university, divided into four levels of College English, leading to varied learning experiences and challenges.

3.4 Problem Four: Vocational Schools Use Secondary Vocational Textbooks for High School Education

In mathematics, many fundamental topics related to higher mathematics are not covered in high school for vocational students. The crucial period for vocational students in their third year of high school focuses on preparing for vocational technical examinations, emphasizing practical skills over academic subjects. This shift in focus during the second half of the third year disrupts their continuity in mathematics learning, affecting their readiness for university-level courses.

In physics, the situation is similar. After passing the high school examination in their second year, vocational schools often discontinue physics courses, further weakening their foundation in this subject.

In English, as Mathematics, the emphasis during the third year of high school remains on preparing for vocational technical exams, leading to a disruption in their language learning continuity.

4. Recommendations for the Project

4.1 Recommendation One: Strengthen Physiological and Psychological Support for Students

Good psychological health is essential for learning. The issues of poor self-management and low motivation, as mentioned in Problem One, often stem from psychological challenges. These issues can be addressed through psychological counseling. Zhejiang University of Science and Technology has qualified psychological counselors and advisors with professional counseling qualifications. However, due to privacy considerations, students seek help only when they feel uncomfortable, and counseling is not mandatory.

To better support students' mental health, the university should leverage its resources to establish a comprehensive psychological support system:

- 1) Proactive Intervention and Continuous Counseling: Implement initial psychological screening and counseling for new students by experienced and qualified psychological counselors. Provide regular or irregular one-on-one counseling based on individual needs, maintaining detailed psychological health records for ongoing support.

- 2) Dormitory Visits and Daily Care: Encourage advisors and psychological counselors to visit dormitories regularly, engaging in informal conversations and observations to identify potential issues. Offer timely

counseling and intervention for students in need and involve them in psychological health activities such as workshops and group sessions to reduce stress and enhance resilience.

4.2 Recommendation Two: Deepen the Practical Teaching System to Stimulate Innovation and Teamwork

Given the strong practical abilities of these students, the university should reform its practices to maximize this advantage:

1) Enhance Practical Teaching Components: Optimize curriculum design to increase the proportion of practical teaching. Collaborate with enterprises and build training bases to provide more opportunities for real-world work experience. Encourage participation in research projects and skills competitions to foster learning through practice.

2) Integrate Innovative Thinking Training: Incorporate innovative thinking exercises into counseling and daily teaching, encouraging students to question, explore, and experiment. Utilize case studies and brainstorming sessions to unleash their creative potential and support them in implementing new ideas.

3) Showcase Practical Projects: Establish platforms or exhibition areas for students to display their projects and achievements. This enhances confidence and provides a sense of accomplishment, fostering cross-disciplinary and cross-grade learning and interaction.

4) Promote Teamwork: Emphasize the importance of teamwork in practical teaching and project collaboration. Organize team projects and collaborative competitions to develop students' teamwork and communication skills. Strengthen class culture and team-building activities to create a positive and supportive team environment.

4.3 Recommendation Three: Adjust Teaching Based on Feedback

As a new field, the "ZBYTH" program's curriculum needs to continuously adapt to student needs and feedback. Despite regular and ad hoc meetings to adjust teaching methods based on previous experiences, further improvements are necessary. The university should take the following measures to optimize the curriculum:

1) Regular Evaluation and Feedback: Establish a regular course evaluation and feedback system through surveys, meetings, and other methods to gather opinions from students, instructors, and colleges. Adjust course content, teaching methods, and assessment criteria based on feedback to maintain course quality and effectiveness.

2) Personalized Teaching Plans: Develop personalized teaching plans based on students' learning backgrounds and interests. Implement differentiated teaching and small class instruction to meet diverse learning needs and improve satisfaction and outcomes.

3) Dynamic Curriculum Adjustment: Continuously adjust the curriculum to align with the characteristics of the "ZBYTH" program and student development needs. For foundational courses like mathematics, increase learning time and difficulty to enhance mathematical literacy and logical thinking. For specialized courses, update content and methods based on industry trends and employer needs to develop professional skills and practical abilities.

4.4 Recommendation Four: Collaborate with Vocational High Schools for Precision Training

To further improve training quality, the university should establish close partnerships with the vocational high schools where new students come from to create and implement coordinated training plans. Specific recommendations include:

1) Joint Training Plans: Collaborate with vocational high schools to develop training plans based on students' learning foundations and development goals. Define objectives, curriculum, teaching methods, and assessment criteria to ensure comprehensive and systematic education.

2) Tracking and Feedback Mechanism: Establish a system to track and evaluate students' academic progress and overall development regularly. Adjust training plans and teaching methods based on evaluation results to ensure quality education and effective talent cultivation.

4.5 Recommendation Five: Constructing an Educational Informatization Platform.

The "ZBYTH" project is not exclusive to Zhejiang University of Science and Technology; it has already been widely implemented in all provincial undergraduate institutions in Zhejiang Province. Each university, based on its unique characteristics, has established specialized training programs. For example, Zhejiang Normal University focuses on early childhood education, while the Medical School of Hangzhou Normal University is dedicated to training nursing and healthcare personnel. Under this shared vision, cultivating high-quality students in the "ZBYTH" program has become the common goal of all universities.

Cultivating high-quality students in the "ZBYTH" program has become a collective mission and pursuit of universities across the province. Therefore, constructing a collaborative network platform for universities across the province is particularly urgent and important. This platform aims to maximize the utilization of educational resources through the establishment of a close network connection mechanism, promoting resource sharing and experience exchange.

Specifically, universities can share public course video resources on this platform, allowing students to access high-quality teaching content regardless of their location. Simultaneously, students and teachers are encouraged to upload their learning experiences and research achievements, forming an active online learning community to promote the collision and integration of knowledge. Moreover, the platform will serve as a bridge for inter-university communication and cooperation, regularly organizing online seminars and experience-sharing sessions to jointly explore best practices in project implementation and address challenges encountered in the educational process together.

Through such a comprehensive, open, and interactive network platform, we can cultivate more graduates of the "ZBYTH" program who possess solid professional knowledge and skills and meet the developmental needs of the new era. This initiative will inject new vitality and momentum into the construction of our country's vocational workforce, promoting the development of China's manufacturing industry and related sectors to higher quality and higher levels.

5. Measures Implemented by the University Based on Recommendations

5.1 Measure One: Establishing a Communication Mechanism

According to the spirit of the tripartite meeting held in June 2022 by the Zhejiang Provincial Department of Education, Zhejiang University of Science and Technology, and vocational high schools, Zhejiang University of Science and Technology has established a robust communication and cooperation mechanism with all vocational high schools. Both parties agreed to regularly communicate once a month and hold irregular meetings as needed. Additionally, they plan to hold bi-annual summary meetings and at least one comprehensive annual meeting to systematically evaluate the cooperation's effectiveness and deeply care for students' growth and development.

5.2 Measure Two: Enhancing Physiological and Psychological Support for Students

Firstly, the university has further strengthened its attention to the psychological health education system for "ZBYTH" students, ensuring seamless integration throughout their educational journey. This system includes specialized psychological health education courses embedded in daily teaching, and it relies on the keen insights of professional psychological counselors and advisors who continuously monitor students' psychological states. The courses cover a wide range of topics, such as emotional management, stress coping strategies, interpersonal skills, and self-awareness enhancement, aiming to build a solid psychological foundation and improve students' self-adjustment and growth abilities.

Secondly, recognizing the crucial role of teachers in students' psychological health education, the university has intensified training for psychological teachers, significantly enhancing their professional skills and capabilities. Through expert lectures, practice-oriented workshops, and in-depth case studies, teachers have mastered advanced psychological counseling skills, enabling them to detect and address students' psychological issues promptly and effectively.

Thirdly, the university has cultivated a positive, harmonious campus culture as a nurturing ground for students' psychological well-being. Various extracurricular activities, club events, and volunteer projects have been organized to provide students with platforms to showcase their talents, build their confidence, and foster a sense of belonging, contributing to their overall psychological development.

Lastly, recognizing individual differences among students, the university adopts a personalized education approach, offering tailored psychological support strategies based on each student's unique needs and challenges. Through scientific psychological assessment tools and in-depth interviews, the university comprehensively understands students' psychological states and requirements, providing customized support to ensure each student receives the most suitable care and guidance.

5.3 Measure Three: Optimizing the Training Program

Given that this program is an innovative attempt in the education field, it faced unprecedented challenges at its inception. When the first batch of "ZBYTH" students entered the university in 2021, the preparation stage revealed some inadequacies, as the initial training plan, though focused on vocational training, did not sufficiently meet the program's unique needs, comprising less than 20% of the curriculum.

After a year of careful cultivation and in-depth exploration, the colleges gained a more comprehensive understanding of the student group. In anticipation of the second batch of "ZBYTH" students in 2022, they proactively revised and optimized the original training plan, significantly increasing the proportion of vocational training to about 50%, aiming to strengthen students' practical skills and vocational qualities.

To address the relatively weak theoretical foundation of these students, the colleges adopted flexible teaching adjustments, such as lowering the difficulty of some courses or adjusting course levels to ensure all students could keep pace. For certain courses, they increased teaching hours while maintaining content to provide more ample learning time and support.

Moreover, to ensure the continuous effectiveness and adaptability of the training program, the colleges established a dynamic adjustment mechanism, regularly reviewing and revising the training plan based on annual outcomes and feedback. This approach aims to create a curriculum that reflects the characteristics of vocational education while accommodating students' individual development needs.

5.4 Measure Four: Optimizing Training Programs in Vocational High Schools

To address the issues of weak foundations and knowledge gaps in mathematics and physics, vocational high schools have adopted high-standard teaching strategies for "ZBYTH" students. These strategies aim to ensure that students receive education equivalent to or better than their peers in regular high schools, enabling them to better adapt to university requirements.

Vocational schools have aligned their teaching plans with regular high school curricula for mathematics and physics, using excellent high school textbooks to provide a comprehensive and systematic knowledge framework. Innovative teaching methods, such as heuristic teaching, case analysis, and experimental exploration, have been employed to enhance students' learning interest and initiative. Teachers also focus on interactive teaching to understand students' learning conditions and provide personalized guidance to ensure progress.

5.5 Measure Five: Improving the Informatization Platform.

Zhejiang Province already has the "Zhejiang Province Higher Education Online Open Course Sharing Platform" (<http://www.zjooc.cn>), which has been meticulously developed over many years and has reached a state of maturity and perfection, gathering an extremely rich collection of educational resources. This platform serves as a hub for sharing valuable information such as open course materials, teachers' insights, students' reflections, and exam papers among universities in Zhejiang Province. It also offers diverse functions like personalized class creation, online learning, and interactive quizzes, greatly promoting the optimization and efficient utilization of educational resources.

Given the comprehensive and efficient nature of this existing platform, constructing a new platform might lead to resource duplication and waste. Therefore, we will fully leverage the existing advantages of the "Zhejiang

Province Higher Education Online Open Course Sharing Platform" as an essential tool to support student learning and deepen teaching reform.

Through this platform, teachers and students can transcend time and space constraints, flexibly participate in course learning, exchange insights, complete assignments and tests, achieving the digitization, networking, and intelligentization of the teaching process. This initiative not only effectively enhances teaching quality and efficiency but also stimulates students' interest and initiative in learning, laying a solid foundation for cultivating high-quality talents with innovative spirit and practical ability. Currently, the platform's role in assisting teaching has achieved remarkable results and has been widely praised and highly evaluated by teachers and students.

6. Results of the Measures

In the fall of 2023, Zhejiang University of Science and Technology welcomed the first batch of "ZBYTH" students trained under the new standards, showing noticeable improvement in their high school knowledge compared to previous cohorts.

Table 4 Displays the average GPA of "ZBYTH" students in various majors and their non-"ZBYTH" counterparts as of July 2024.

Major/Grade (ZBYTH)	Average GPA for Entire Major	Major/Grade	Average GPA for Entire Major
MDMA-ZBYTH 21st Grade	2.605684	MDMA 21st Grade	2.463573
MDMA-ZBYTH 22nd Grade	2.608527	MDMA 22nd Grade	2.373701
MDMA-ZBYTH 23rd Grade	2.447421	MDMA 23rd Grade	2.346740
BEI-ZBYTH 21st Grade	2.499114	BEI 21st Grade	2.453981
BEI-ZBYTH 22nd Grade	2.305649	BEI 22nd Grade	2.203609
BEI-ZBYTH 23rd Grade	2.379605	BEI 23rd Grade	2.434491
DM-ZBYTH 21st Grade	2.625351	DM 21st Grade	2.368103
DM-ZBYTH 22nd Grade	2.799364	DM 22nd Grade	2.549397
DM-ZBYTH 23rd Grade	2.708114	DM 23rd Grade	2.488575
AU-ZBYTH 21st Grade	2.343973	AU 21st Grade	2.510862
AU-ZBYTH 22nd Grade	2.098098	AU 22nd Grade	2.376728
AU-ZBYTH 23rd Grade	2.687750	AU 23rd Grade	2.624105

Notes:

1) Data collected at the end of the second semester of the 2023-2024 academic year.

2) GPA scale is out of 4.

3) The "MDMA" major in the table is "Mechanical Design, Manufacturing and Automation" major, the "BEI" major is "Building Electrical and Intelligence" major, the "DM" major is "Digital Media Technology" major, and the "AU" major is "Automation" major.

From Table 4, it is clear that in the first academic year of 2023, the average GPA of "ZBYTH" students in Mechanical Design, Manufacturing, and Automation, as well as Digital Media Technology, significantly surpassed that of their counterparts admitted through traditional entrance examinations. Notably, although the average GPA of "ZBYTH" students in the Automation major was slightly lower than that of regular students, the difference was minimal, only 0.023 points. Similarly, the "ZBYTH" students in Building Electrical and Intelligence had an average GPA slightly lower by about 0.1 points.

Further analysis reveals that "ZBYTH" students in Mechanical Design, Manufacturing, and Automation, Digital Media Technology, and Building Electrical and Intelligentization showed a consistent advantage in average GPA over regular students in both the 2022 and 2023 cohorts. This trend highlights the positive outcomes of the "ZBYTH" educational model and the students' strong academic competitiveness and continuous improvement capabilities.

Examining the data behind Table 4, it becomes evident that the "ZBYTH" project students possess extraordinary potential and growth momentum. Since the initial challenges faced by the 2021 cohort, Zhejiang University of Science and Technology has tailored specialized training programs and provided targeted support, resulting in significant improvements. The 2021 cohort's average GPA surpassed that of regular students, setting a precedent

for the subsequent 2022 and 2023 cohorts to maintain and expand this academic advantage. These academic achievements underscore the success of the "ZBYTH" project in talent cultivation, offering valuable practical examples and references for future educational model innovations.

7. Summary

Overall, through the comprehensive implementation of the "ZBYTH" student training plan, we have observed that these students excel in practical skills, possessing a solid foundation in vocational abilities and standing out in hands-on fields. However, we also identified challenges, such as the need for better self-management and increased learning motivation.

To address these problem, universities and vocational high schools have joined forces, implementing precise and effective targeted training strategies from multiple dimensions and aspects, including students, teachers, higher education institutions, vocational high schools, and educational informatization. After three years of relentless effort and meticulous refinement, we proudly announce that the "ZBYTH" project has successfully achieved its established goals, resulting in a significant enhancement and comprehensive development of students' overall qualities. This achievement is not only a powerful testament to the practice of educational innovation but also sets a benchmark for the optimization and upgrading of future educational models.

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