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Training Mode of School-Enterprise Cooperation and Collaborative Education in the Major of Information and Computational Science

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Abstract: School-Enterprise cooperation represents a relatively modern and innovative model for talent education and training. By using the theory of hierarchical teaching, students are classified according to industry demands, ensuring targeted and practical development. Taking the Information and Computational Science major at Dalian Minzu University as a case study, this paper provides a detailed exploration of the collaborative education and training model fostered through School-Enterprise partnerships. It is hoped that the insights and experiences shared herein can offer valuable reference and support for the advancement of similar programs at other higher education institutions.

Keywords: School-enterprise cooperation; Collaborative education; Innovation training

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1. Introduction

Through the investigation and analysis of the data of the talent market and the employment destination of graduates, it is found that the demand for talents majoring in information and computational science (hereinafter referred to as information science) is still very large [1]. With the development of the economy and society, scientific research institutes, the information industry, banking, securities, finance, and other industries need a large number of application-oriented talents specializing in information technology. In particular, in some high-tech fields, there is an urgent need for high-level applied talents who have solid mathematical backgrounds. These professionals must master the fundamental theories, methods, and skills of information science, computer science, economics, and financial mathematics to effectively solve complex practical problems [2–5].

Due to the expansion of university enrollment and shifts in enrollment policies, the overall academic foundation of students has weakened, resulting in significant performance disparities among students from different provinces of China. This poses substantial challenges for university education. Furthermore, many students struggle to adapt to the new pedagogical methods, often exhibiting poor learning attitudes and a lack of clear academic goals. The diversification of career paths further complicates the teaching landscape.

Consequently, the traditional curriculum system can no longer meet the needs of cultivating applied talents with strong social adaptability and employment competitiveness. This misalignment has led to a paradoxical situation: while the market urgently demands skilled professionals, many graduates remain unemployed due to high industry skill requirements and fierce market competition. Therefore, it is imperative to change from passive acceptance to active adaptation,. to actively adapt to the demand for talent in the market. To bridge this gap, a shift from passive acceptance to active adaptation is imperative. Therefore, researching innovative training models for Information Science professionals has become a top priority. Such research is not only an inevitable trend in higher education reform but also an urgent necessity driven by socio-economic development.

Meanwhile, the training model of School-Enterprise cooperation provides substantial support for the healthy development of higher education institutions. As a relatively modern education and training model, it has been successfully implemented for many years in developed countries across Europe and the United States [2–4]. Practice has proved that this approach acts as a catalyst for mutual growth, injecting vitality into both academic and industrial sectors. Specifically, it assists universities in addressing the scarcity of educational resources and bridging the gap between academic instruction and practical production needs. Simultaneously, it cultivates development-oriented talent tailored to the specific requirements of enterprises, fostering their long-term advancement.

However, a fundamental and robust training model for school-enterprise cooperative education has yet to be fully established. Currently, collaboration remains characterized as 'hot in schools but cold in enterprises,' often existing in a state of shallowness, looseness, and low-level engagement [5]. The enthusiasm of enterprises to participate in talent cultivation remains low, resulting in a significant disconnection between curriculum content and professional standards. Consequently, the issue of 'emphasizing theory while despising practice' remains pervasive within most application-oriented universities.

In this paper, we mainly focus on solving the following three research questions:

(1) RQ1 How to deepen the breadth and depth of industry-education integration projects aimed at a stable double-qualified teaching staff and more practice training base outside the school?

(2) RQ2 How to guarantee the enterprises' practical benefits from the integration of production and education, and improve their participation enthusiasm?

(3) RQ3 How to fully utilize the high-quality resources of enterprises and benefit more teachers and students from different majors and educational background?

The study employed a mixed-methods research design, incorporating both quantitative and qualitative data collection and analysis techniques.

2. Innovation-oriented training mode

According to the sorting teaching theory and the need for the development of the information science major and the cultivation of talents, we sort the students of this major into two categories: the postgraduate entrance examination improvement class and the broadening application class (**Figure 1**).

Broadening the applied students is mainly based on the training model of School-Enterprise cooperation, while this approach is mainly aimed at students who have a weak foundation in mathematics but can use the mathematical knowledge they have learned and proficient computer skills to solve practical problems. Since 2018, the university, in collaboration with partner enterprises including Tentact Dalian and SV Insight, has jointly recruited students for the 'Intelligent Software Development' program. Those enterprises are known as a human resource service organization under Dalian Software Park and the Chengdu High-tech zone. Numerous

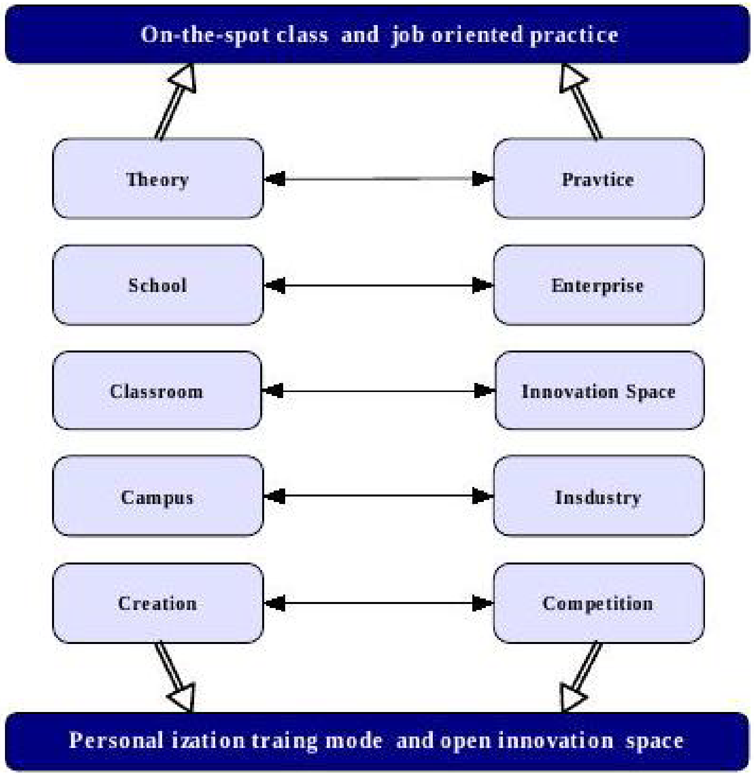

Figure 1. Training mode for the talent students.

other well-known enterprises are also introduced to the university. Taking Sino-soft as an example, it operates as a professional training institution for university students, which specializes in fields including software development, integrated circuits, the Internet of Things, embedded systems, and embedded service outsourcing.

We adopted a "learning-training-relearning-retraining" model during the implementation of School-Enterprise cooperation. That is, after the students complete the course, they will have a semester of training at the end of the semester. With the accumulation of professional knowledge, the difficulty of the actual project of the semester training also increases. Following the completion of enterprise training, students proceeded to on-the-job internships where they undertook their graduation projects. This phase enabled them to gradually develop the core competencies required of software development engineers, including communication skills, the ability to solve problems using professional knowledge, project management and organization, teamwork, practical English proficiency, and capabilities in innovation and entrepreneurship. The cooperation with SV light training is based on the first start in 2021, and it has recruited 30 students in the direction of software development and blockchain security with an increasing trend.

2.1. Professional training model oriented to industrial needs

For the cooperative major, Tentact Dalian has collaborated with Dalian Minzu University to formulate a specialized talent training program and a teaching operation plan, aligning the curriculum with the specific demands of the industry and enterprises.

The program adopts a '2.5 + 1.5' cooperative education mechanism.

(1) Phase 1 (Semesters 1–5): During the first five semesters, students remain on the university campus to

complete foundational and professional core courses. While the primary instruction is delivered by the university's faculty, the partner enterprise supports this phase by providing teacher training, online educational platforms, and technical experts to enhance students' practical and hands-on skills.

(2) Phase 2 (Semester 6): In the sixth semester, students transition to the enterprise training base to complete advanced professional theory courses and laboratory experiments.

(3) Phase 3 (Semester 7): At the beginning of the seventh semester, students engage in practical training at the enterprise's training base, working on enterprise-level development projects. This phase is conducted concurrently with the completion of their graduation design (thesis), ensuring the research is grounded in real-world application.

(4) Phase 4 (Semester 8): The enterprise is responsible for the internship of students entering the enterprise, and the students complete the graduation project (thesis) under the joint guidance of teachers from both sides.

The primary objective of practical teaching is to reinforce theoretical mathematical knowledge and cultivate students' ability to solve real-world problems through diverse experiential components. It is an indispensable element in the cultivation of applied talents. The practical teaching system for the Information and Computational Science major is comprehensive, encompassing curriculum-based practical training, professional practice (including graduation projects and internships), social practice, and employment guidance activities.

2.2. Further optimization of the practical teaching system

On the basis of the original training model cooperated with IT enterprises, we actively carry out inquiry-based practical teaching and establish and open mathematics laboratories. Through seminar-based teaching, open-ended, and problem-based homework training, students will be trained to use mathematical knowledge to solve practical problems. In addition, the second class is actively carried out, especially the mathematical modeling competition and mathematical modeling training, so that the students' mathematical thinking ability, mathematical application ability, and innovation ability to solve practical problems can be improved.

The training is responsible for the implementation of students' employment, and ensures that at least 3 jobs are provided for each student with employment needs, except for those who are admitted to graduate school. Both sides cooperate to guarantee that of students will enter the work of large and medium-sized software enterprises in China after graduation, and ensure that the employment rate of qualified graduates will reach more than 90%.

The direction of intelligent software development is directly oriented to the application and design direction of the industry, and the traditional faculty construction mode is easy to be out of touch with the practice of the industry, which affects the quality of talent training. Enterprise training regularly provides case teaching and practical training courses for teachers in our school, and faculty teachers are encouraged to enter enterprises for short-term engineering practice in a planned way, so that teachers can continuously consolidate and update their professional knowledge, and grasp the cutting-edge trends of the industry by participating in the actual projects of enterprises.

2.3. Reform and innovation of teaching methods

Following the concept of characteristic major construction, we adopt a combination of heuristic and inquiry-based teaching methods to inspire students' wisdom. The combination of case-based and seminar-based teaching methods is adopted to cultivate students' ability to analyze and solve problems.

We adopted a student-centered approach in this model. It deepens the reform of classroom teaching methodologies through the following strategies:

(1) Fostering Independent Learning: Implementing a blended approach of self-study and instructor guidance to promote autonomous learning.

(2) Inspiring Critical Thinking: Utilizing heuristic and inquiry-based methods to stimulate intellectual curiosity and insight.

(3) Developing Problem-Solving Skills: Employing case-based and seminar-style instruction to enhance students' abilities to analyze and resolve complex issues.

Furthermore, the curriculum extends beyond the traditional classroom through lectures, extracurricular activities, and participation in science and technology competitions to cultivate well-rounded competencies.

3. Identifying contributing features

To gain deeper insights into experiences and attitudes toward School-Enterprise cooperation, we conducted semi-structured interviews with a subset of participants who opted-in for the follow-up interview. The interviews were approximately 25–30 minutes long and used open-ended questions to encourage participants to share their perspectives freely. The interview responses were recorded and later transcribed for analysis. Participants include lectures in the company, human resources who hired our graduates and the campus students, as well as those who have graduated.

Next, we delved into the process of identifying the key contributing features that influence the quality of School-Enterprise cooperation. To accomplish this, we employed regression analysis and utilized the LASSO (Least Absolute Shrinkage and Selection Operator) technique for feature selection. Through this analysis, we aimed to uncover the most significant factors that play a role in shaping educators' attitudes in order of importance.

The analysis yielded a list of features along with their corresponding coefficients, shedding light on the relative impact of each feature. **Table 1** shows the most important factors that influence teacher's sentiment about Generative AI, listed in ranked order.

Table 1. Top 5 factors affecting the quality of school-enterprise cooperation

Rank	Factor	Effect
1	Improvement of application ability	Positive
2	Encouragement of different kinds of employment	Positive
3	Interests of enterprises are guaranteed	Positive
4	Decreases critical thinking	Negative
5	Increase cheating and dishonesty	Negative

It is evident that factors related to application ability, Encouragement of different kinds of employment, and Interests of enterprises are guaranteed to be among the most influential in shaping positive attitudes. Conversely, concerns about loss of creativity and potential for cheating and dishonesty negatively impact attitudes.

Moreover, we extended our analysis to different regression techniques, including Linear Regression, Random Forest, Gradient Boost, and XGBoost. The mean squared errors (MSE) obtained ranged between 0.4 and 0.5, indicating a reasonable level of predictive accuracy using these features.

Overall, our analysis unveils a hierarchy of factors that significantly contribute to School-Enterprises cooperation attitudes. These insights can guide similar majors in China's universities in understanding the intricate interplay of factors that shape attitudes, thereby facilitating informed decision-making and effective implementation strategies.

4. Conclusion

The development of the School-Enterprise cooperative education model represents a significant pedagogical reform implemented on university campuses. It is currently one of the key developmental strategies for local higher education institutions in China and reflects a global trend in the evolution of modern universities. It is hoped that the insights and experiences shared in this paper can offer valuable reference and support for the advancement of similar programs at other higher education institutions.

Disclosure statement

The authors declare no conflict of interest.

References

[1] Tian W, 2024, New Requirements for School-Enterprise Cooperation in Vocational Education under the Perspective of High-Quality Development. Modern Vocational Education, (28): 21–24.

[2] Li Y, 2024, Discussion on the Optimization and Practice of School-Enterprise Cooperation Mechanism in Vocational Education. Journal of Beijing Politics and Law Vocational College, (03): 100–104.

[3] Li Z, Liu M, 2024, Research on the Digitalization of Talent Cultivation in School-Enterprise Cooperation in Vocational Education. Education and Teaching Forum, (26): 109–112.

[4] Ye N, Huang B, 2024, Research on the Practice of School-Enterprise Cooperation in Vocational Education from the Perspective of Enterprises. Journal of Beijing Economic Management Vocational College, 39(02): 43–50.

[5] Zhou H, 2024, Optimization and Practice of School-Enterprise Cooperation Mechanism in Vocational Education. International Journal of New Developments in Education, 6(11): 151–157.