Research on the Construction Path of Intelligent Engineering Micro-Major under the Perspective of Emerging Engineering

Cui Li*, Ruitao Zhou, Qianqian Shao

Qingdao Huanghai University, Qingdao, China

*lic@qdhhc.edu.cn

Abstract. Under the background of Emerging Engineering, the construction of Micro-Major is an important innovative path to cultivate compound talents with interdisciplinary literacy, innovative thinking and practical skills. Aiming at the current problems of Micro-Major talent cultivation, such as the disconnection between curriculum and industry, single faculty and insufficient practice resources, constructed three dimensions of innovative talent cultivation model, constructing curriculum and building faculty, constructed a Micro-Major talent training system adapted to the development of Emerging Engineering. In terms of talent cultivation model, it emphasizes the importance of industry-teaching fusion and interdisciplinary integration; in terms of constructing curriculum, it advocates building a modular and flexible curriculum structure based on competence orientation; and in terms of building faculty, it focuses on introducing industry experts and strengthening teachers' practical ability training. Finally, taking Xunfei Mirage Intelligent Engineering Micro-Major as an example, the feasibility and effectiveness of Micro-Major construction is demonstrated through the in-depth analysis of its practice mode and effectiveness. This case validates the practical value of the theoretical path, and provides a reference and lesson for the construction of other Micro-Major.

Keywords: Emerging Engineering; Micro-Major; talent cultivation; course system; faculty development.

1   Introduction

In the context of a knowledge economy and globalization, the demand for specialized and refined professional skills has surged[1]. To address the technological revolution and industrial transformation, the Ministry of Education has been vigorously promoting the construction of new engineering disciplines since 2017, aiming to cultivate engineering technology talents who emphasize both innovation and practical skills[2]. As an emerging educational model, micro-majors, with their flexibility and specificity, have become an effective platform for interdisciplinary learning and deepening professional capabilities, responding nimbly to technological innovations and industry changes. Their characteristic lies in the deep integration of theory and practice, which not only

enriches educational value but also highlights their unique advantages compared to traditional models[3]. Despite a solid theoretical foundation, the lack of practical cases and experience limits the widespread promotion of micro-majors. Therefore, we propose clear training objectives, curriculum design, and teaching methods centered on student development, combined with market demands and employment trends. Taking "iFlytek Illusion Intelligent Engineering" as an example, we provide a practical guide for the construction of micro-majors in local applied universities, aiming to promote the popularization and development of micro-majors in universities across the country.

2   Existing Problems of Micro-Professional Talent Training

2.1   Limitations in Audience Size

In the context of new engineering education, micro-majors, as an innovative educational model, face the severe challenge of a narrow audience scale. This not only limits the diversification and personalization of talent training programs, making it difficult to meet students' personalized needs and career paths, but also hinders the scale effect of resource allocation and the optimization of faculty team building, thereby affecting the continuous updating and upgrading of teaching resources[4]. At the same time, the small audience also restricts the flexible innovation of teaching models. Traditional models are hard to adapt, and the shortage of funds and teachers makes the transformation of teaching models difficult, lacking the necessary flexibility and innovation, and it is difficult to meet students' increasingly diverse learning expectations.

2.2   Problems of Universality of Content

The cultivation of micro-professional talents faces challenges in the universality of teaching content. Although universal content has broad applicability, it is difficult to delve into specific professional fields, leading to students' lack of mastery in skills, which fails to meet the precise demands of the industry, limiting the development of competitiveness and innovation[5]. At the same time, the integration of teaching content with practical industry applications is insufficient, either focusing too much on theory and neglecting practice, or pursuing cutting-edge technology while being detached from the actual industry, which affects the quality of teaching and the personal development of students[6]. There is an urgent need to optimize this to better align with industry needs and the growth goals of students.

2.3   Uneven Allocation of Teaching Resources

The imbalance in the allocation of educational resources severely hinders the in-depth development of micro-majors, causing them to rely on the residual resources of universities for construction, and making it difficult to obtain the same level of resource investment as the main majors. This unbalanced distribution restricts the development of micro-majors in terms of curriculum innovation, teaching methods, and practical

experiments, thereby affecting the quality of education and the learning experience of students[7]. At the same time, the shortage of resources leads to the simplification of teaching content and methods, which is not conducive to the cultivation of students' knowledge depth, application ability, innovative thinking, and problem-solving skills.

3   Key Aspects of Micro-Major

3.1   Research on the Training Mode of Industry-demanded Innovative Talents

The core of micro-professional construction lies in the exploration and implementation of innovative talent cultivation mode[8]. Relying on the existing hardware facilities and with the advantageous resources of industry-leading enterprises such as XunFei Mirage (Qingdao) Technology Co., Ltd, we cultivate the career development potential of students to meet the market demand for applied innovative talents. To build an industry demand-oriented talent cultivation model as shown in Figure 1, adopting the educational strategy of "school-enterprise dual-drive + project pedagogy" to achieve the in-depth integration of school education and enterprise practice, and promote the overall development of students. Under the joint drive of school and enterprise, the curriculum is optimized by combining the industrial development trend and market demand, introducing cutting-edge technologies and real project cases, so that students can learn, explore and grow in practice.
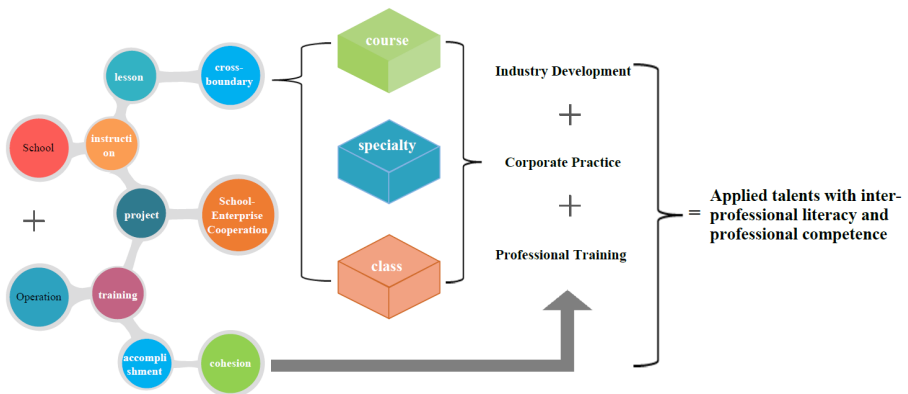

Fig. 1. Diagram of the Industry Demand Driven Talent Development Model.

3.2   Reconstruction of the "Three-dimensional Quality Cultivation" System of the Curriculum

The restructuring of the micro-professional curriculum system focuses on distilling core knowledge and designing a concise, sequential, and practical curriculum system, covering 3 to 8 courses, aimed at enabling students to grasp the essence of a specific field in a short period. This system constructs a three-dimensional quality training framework through vertical exploration of "course difficulty-categories," horizontal

expansion of "training stage-categories," and comprehensive advancement of "training stage-difficulty," ensuring that students' theoretical learning and practical skills are equally emphasized[9], and comprehensively enhancing professional literacy and over-all capabilities.

3.3   Bi-directional Integration between Schools and Enterprises, Creating a "Dual Teacher" Type Of Teaching Force

Leveraging the advantages of industry-education integration within our institution, we have adopted a strategy of internal cultivation and external talent attraction, establish-ing a matrix-style collaborative mechanism. This has brought together leading figures such as innovative technology talents, master craftsmen, and industry professors. These leaders guide the formation of a cross-campus virtual teaching and research office team. The team is founded on professional knowledge, skills, teaching standards, and rich experience, breaking through barriers of time, space, and institutional boundaries to provide students with high-quality teaching and professional guidance that transcends borders. This ensures the cutting-edge nature and practical effectiveness of micro-pro-fessional courses.

4   The Construction and Implementation of Xunfei Phantom Intelligent Engineering Micro-Major

In response to the "AI + X" strategy, the school has partnered with iFlytek Horizon (Qingdao) Technology to establish the "iFlytek Horizon Intelligent Engineering" mi-nor, focusing on cultivating compound talents in the VRAI field. This minor deeply integrates theory with practice, using real enterprise project cases for teaching to ensure that technical standards are consistent with commercial development. The curriculum design covers skills such as development, modeling, animation, and programming, en-hancing students' practical abilities, teamwork spirit, and professional qualities through practical projects. It aims to supply society with urgently needed cross-disciplinary compound talents. Upon completion of their studies, students will receive a minor cer-tificate to boost their career development.

4.1   Cultivation Objectives and Curriculum Construction of Micro-professionalism

The "iFlytek Fantasy Intelligent Engineering" micro-major, as a cutting-edge discipline that integrates multiple fields, aims to alleviate the contradiction between talent supply and demand, attracting students from backgrounds such as mechanical and electrical engineering, art, computer science, and more. By complementing their professional shortcomings, it cultivates compound innovative talents with professional skills in the field of artificial intelligence, multidisciplinary integration capabilities, awareness of lifelong learning, team spirit, craftsmanship, and a high sense of responsibility. The curriculum system of this major is centered around practical projects, integrating

"knowledge and ability," and is divided into three levels of projects to emphasize the gradual enhancement of basic knowledge and the ability to solve complex problems. At the same time, it adopts the "scaffolding" concept to construct the course sequence, ensuring efficient and orderly learning. In terms of teaching, it combines online self-study with offline face-to-face classes and practical classes, sets up four professional courses, and through a "student group - dual mentors - class" three-level management model, it strengthens team cooperation and personalized guidance, and comprehensively enhances students' overall capabilities. Teaching methods for Micro-Major.

The "iFlytek Fantasy Realm Intelligent Engineering" minor program implements a blended teaching model that combines online and offline methods. Students flexibly use the Yuque APP to study theory online and complete tests, while also participating in offline face-to-face classes to deepen their understanding and interaction, and to complete assignments and reports. In the project design phase, the teaching team publishes specific tasks, supplemented by a weekly progress schedule to guide students to advance on time. Students, in the project practice, solve problems through diversified methods such as self-study, group discussions, and teacher Q&A, forming a mutual learning team, and comprehensively enhancing their professional skills and collaborative abilities.

4.2   Implementation of Talent Cultivation of Micro-professionalism

The micro-professional curriculum of "Xunfei Mirage Intelligent Engineering" is self-contained, with a low entry threshold for students, no need for pre-requisite courses, and full-time undergraduates of all grades can enroll in the micro-professional program without limiting the majors of the students. The micro-professional 2022, in Qingdao Huanghai College enrollment operation, through the school's website, Big Data College WeChat public number and other unified release "Xunfei illusion of intelligent engineering" micro-professional introduction and enrollment information. After the release of micro-professional enrollment information, the first batch of "Xunfei illusion of intelligent engineering" micro-professional students first from the big data college admitted 25 people, including students from computer science in technology, data science and big data technology, artificial intelligence, Internet of things engineering, economic statistics, virtual reality and other majors.

4.3   Evaluation Mechanism for Micro-professional Curriculum System

The "iFlytek Fantasy Realm Intelligent Engineering" minor program establishes a dynamic student evaluation mechanism to select students interested in virtual reality, encouraging them to complete project production in their spare time and holidays to cultivate innovative consciousness and capabilities. This mechanism stimulates learning enthusiasm through a student mobility mechanism and ensures project quality. At the same time, the major has also established a multi-dimensional course project feedback mechanism, including feedback on the practice process, project production quality, and outcomes, to continuously improve project design. The assessment method is a concentrated time assessment, mainly evaluating the U3D AR project design ability, with one

chance for a retest for those who do not pass. Students may extend their study time to 24 months after the enrollment date under special circumstances. A credit system is implemented, and students must complete 15 required credits within the specified years. A completion certificate is issued upon passing the grades, and those with outstanding performance have the opportunity to be directly employed by the company.

5   Conclusion

In order to keep pace with the times, the training plan for the minor in "Intelligent Engineering" needs to be regularly adjusted and optimized to adapt to the rapidly developing discipline of artificial intelligence. The teaching level of minor teachers should also be further improved. They need to engage in self-study, possess a broad knowledge base, and communicate with students from different professional backgrounds. In addition, teachers should participate in collective lesson preparation and other teaching activities to leverage the advantages of the team and jointly explore the best development path for the minor. At the same time, regular exchanges between teachers and with teachers from other colleges should be promoted to understand the learning situations of students from different professional backgrounds, which is of great significance for optimizing the training plan and teaching content.

Acknowledgement

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