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Research on Innovative Pathways For Cultivating Micro-Major Talents in Business Data Analysis and Decision-Making Based on The Integration of Science, Industry and Education

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Abstract

In the digital economy era, enterprises are witnessing a soaring demand for compound talents who "understand data, excel in technology, are well-versed in business, and are skilled in decision-making". To improve the fit between supply and demand on talent cultivation, the Ministry of Education has launched the "Double Thousand" plan, encouraging universities to help students fill gaps in knowledge and skill sets through establishment of micro-majors. This paper thoroughly examines the key challenges universities currently face in developing micro-major in business data analysis and decision-making. It proposes a compound talent cultivation pathway centered on "interconnection of four chains, three-dimensional collaborative, trinity, and dual nature with one degree", thereby exploring a systematic and actionable innovative path for the high-quality development of university disciplines.

Keywords

Integration of Technology, industry, and education; Business Data Analysis and Decision Making; Micro-majors; Innovative Approaches to Talent Development

1. Introduction

The world today is experiencing a profound transformation driven by data. The deep integration of next-generation information technologies, including big data, artificial intelligence, and cloud computing, with the real economy has not only spawned a multitude of new business formats and models but also imposed unprecedented demands on the knowledge structure and skill set of talents. As the pivotal link connecting technology and business value, professionals in the field of business data analysis and decision-making have emerged as a critical strategic resource for propelling corporate digital transformation and bolstering national

digital competitiveness. Nevertheless, the slow pace of curriculum updates in traditional business disciplines makes it challenging to keep abreast of rapid technological advancements; while engineering majors boast technical prowess, they often lack a profound grasp of business logic and management contexts, resulting in structural contradictions in talent development. Against this backdrop, the "Double Thousand " plan launched by the Ministry of Education—aimed at fostering the establishment of 1,000 "micro-majors" (or specialized course clusters) and 1,000 vocational skill training courses across universities nationwide—offers an innovative solution to this conundrum. Micro-majors, characterized by their "compactness, modularity, interdisciplinarity, and precise employment orientation", serve as an effective conduit linking core majors with the evolving demands of industry frontiers (Xu et al., 2023). Regrettably, the current development of new business micro-major is generally plagued by issues such as ambiguous target positioning, inadequate faculty capabilities, scarce practical resources, and limited social recognition (Qiu, 2026). There is an urgent imperative to explore a practical and effective talent cultivation pathway to empower students to swiftly enhance their employability prior to graduation and facilitate high-quality, full employment.

2. The Real-world Challenges in Establishing the Micro-major in business Data Analysis and Decision-making

The micro-major in Business Data Analysis and Decision-Making was initially established to bridge the divide between academic education and industrial practice, yet its implementation has faced constraints from multiple factors.

Firstly, there exists a misalignment between goal setting and industrial demands. At present, some universities fail to conduct thorough research on regional industrial chains and job competency frameworks when establishing the micro-major in business data analysis and decision-making. Consequently, there is a notable discrepancy between the course content and the actual data analysis workflows, toolkits, and business scenarios encountered in enterprises, leading to a passive predicament where "learning and practical application are divorced from each other" (Wang et al., 2022).

Secondly, the teaching staff's cross-disciplinary competence is inadequate. The cornerstone of constructing high-quality micro-majors lies in assembling a "dual-qualified" teaching team that combines academic profundity with industrial expertise. Business data analysis and decision-making represent a quintessential interdisciplinary domain, necessitating that instructors possess not only a solid grasp of technical principles like statistics and machine learning but also a profound understanding of business management logic. Nevertheless, in-house faculty members often lean towards one specialty, lacking hands-on experience in tackling intricate business data challenges at the forefront of enterprises (Wang, 2025). Meanwhile, enterprise mentors, constrained by time limitations and incentive

structures, tend to confine their involvement to delivering lectures, struggling to engage deeply in course design and offer comprehensive guidance throughout the entire process.

Thirdly, there is a shortage of teaching resources and practical platforms. Genuine enterprise datasets, computing power platforms, and real-world business environments are essential for nurturing students' practical skills. Nevertheless, universities commonly encounter challenges such as difficulties in acquiring data, exorbitant costs for platform development, and a substantial disparity between experimental settings and actual business scenarios. Consequently, teaching tends to lean towards theoretical reasoning and simplified case studies, failing to effectively hone students' capabilities in managing complex data, addressing business uncertainties, and engaging in effective communication and decision-making.

Fourthly, there is a need to enhance quality assurance and social recognition. As a novel educational model, micro-majors currently lack a standardized system for evaluating teaching quality. The recognition of micro-certificates, which represent learning achievements, in the job market remains insufficient, thereby dampening students' enthusiasm for learning and reducing enterprises' willingness to embrace them. These issues not only impede the sustainable development of micro-majors but also hinder their role as a vital platform for lifelong learning and skill enhancement.

Confronted with the aforementioned dilemmas, eliminating the barriers among technology, industry, and education and achieving the integration of resources, processes, and evaluation systems have become the indispensable route for the high-quality advancement of the micro-major in business data analysis and decision-making.

3. Construction of an Innovative Talent Cultivation System Based on the Integration of Technology, industry, and education

Indeed, fostering deep integration among technology, industry, and education is pivotal to forging an innovative pathway for cultivating talents in the micro-major in business data analysis and decision-making. This integration not only facilitates the swift renewal and innovation of disciplinary knowledge but also effectively bridges the gap between educational offerings and industry demands, equipping students with more practical skill sets and enhancing their professional qualities, thereby paving the way for their successful entry into a high-caliber job market. Consequently, to tackle the myriad challenges encountered in the development of the micro-major in business data analysis and decision-making, this paper adopts a reform strategy guided by the principles of "demand-orientation, education-orientation, engineering-orientation, and resource-orientation" to establish a talent cultivation system centered on "four-chain integration and

three-dimensional collaboration" for the profound integration of technology, industry, and education.

1. Demand-Oriented Approach: Reconstructing a Dynamic Training Scheme with "Four-Chain Integration"

The cornerstone of talent development lies in precisely addressing the evolving demands of the times and industrial transformation on the talent capability structure. This framework centers on the profound integration of the "industry chain, innovation chain, education chain, and talent chain", establishing a closed-loop feedback and continuous improvement mechanism.

Firstly, we should align closely with industry chain requirements. This involves collaborating with leading technology firms in the region to form a professional development steering committee, conducting regular surveys on industry talent needs, and delineating capability profiles for key roles such as business data analysts, data scientists, and business intelligence consultants, while specifying the necessary technical stacks, toolkits, business knowledge domains, and soft skills.

Secondly, we must incorporate elements from the innovation chain. Leveraging universities' cutting-edge research in areas like artificial intelligence, operations optimization, and behavioral economics is crucial for enhancing the sophistication and innovation of teaching materials. These research findings should be translated into teaching cases and integrated into classroom instruction to expose students to the latest research methodologies.

Thirdly, we need to revamp the education chain's content. By integrating industry chain demands with innovation chain resources, we can develop a modular and progressive "1+X+Y" curriculum system: "1" denotes a core course in business data analysis and decision-making; "X" represents a suite of advanced courses categorized by technical specializations, enabling students from diverse academic backgrounds to select courses that synergize with their majors; "Y" encompasses a series of project-based practical courses that span the entire program.

Fourthly, we must ensure seamless talent chain development. To facilitate a smooth transition from knowledge acquisition to professional proficiency, a phased development pathway covering the entire training cycle should be designed. This pathway will guide students through a progression from mastering "basic skills and thinking" to achieving "domain expertise and project application", culminating in "graduation projects or corporate internships", thereby ensuring a seamless alignment between talent development and career advancement.

2. Educational Orientation: Establishing a "Three-Dimensional Collaborative" Cross-Sector Educational Consortium

The diversification and synergy of educational stakeholders constitute the cornerstone mechanism for ensuring the cultivation of high-caliber, interdisciplinary talents. To effectively integrate technological, industrial, and educational resources, it is imperative to construct a "three-dimensional

collaborative" educational consortium comprising in-house faculty, industry practitioners, and research experts. Through role complementarity, resource sharing, and process integration, this consortium aims to achieve a seamless fusion of theoretical instruction, practical training, and cutting-edge exploration.

Firstly, it is essential to reinforce the integration of teaching and research among in-house faculty. Teachers responsible for micro-major courses are encouraged to incorporate data, challenges, and methodologies from their horizontal or vertical research endeavors into teaching materials. The implementation of a "dual-mentor system", pairing a seasoned teaching master with an industry-experienced professor, is designed to enhance faculty members' practical engineering teaching capabilities.

Secondly, ensuring the deep involvement of industry experts throughout the educational process is crucial. The traditional "lecture-based" participation model should be replaced by engaging enterprise data scientists, chief analysts, and other professionals as course co-developers or project mentors. These experts not only contribute to curriculum design and case development but also provide ongoing guidance for student projects, offering real-world data (desensitized) and industry contexts, and participating in final project evaluations. Additionally, selecting senior data analysts and business department heads from partner companies as "industry professors" or "course collaborators" enables them to extend their involvement beyond lectures to encompass the entire spectrum of course design, project supervision, and graduation assessments.

Finally, fostering the frontier-leading role of researchers is vital. Leveraging the school's AI research institute, big data labs, and other research platforms, non-confidential research datasets and computing resources should be made accessible to outstanding students, encouraging their participation in faculty research projects and providing them with firsthand experience of the entire process from scientific inquiry to data-driven solutions. Attracting researchers from both within and outside the institution who specialize in data science, AI, and related fields to translate cutting-edge algorithms and scientific challenges from national projects into challenging inquiry-based learning projects is also essential.

In essence, through such collaborative efforts, a three-tiered educational framework is established, characterized by "foundational learning on campus, practical application in industry, and frontier exploration through research".

3. Engineering-Oriented Approach: Constructing a "Trinity" Practical Teaching Platform

Business data analysis and decision-making constitute a highly practical engineering endeavor. Efforts should be concentrated on establishing a practical teaching platform that seamlessly blends virtual and real-world elements, as well as learning and innovation.

Firstly, priority should be given to real project-driven learning. Collaborate with partner companies to set up an "Innovation Workshop for Business Data Analysis",

taking on genuine, yet appropriately streamlined, business analysis tasks from enterprises as course projects. Under the joint guidance of mentors from both academia and industry, students work in teams to navigate the entire process, from defining problems, acquiring and cleansing data, constructing models, interpreting results, to compiling business recommendation reports.

Secondly, attention should be directed towards virtual simulation as a supplement. For scenarios involving sensitive data or high-stakes decisions, such as business trade and financial risk management, develop or introduce business simulation systems to replicate dynamic market competition, supply chain fluctuations, and other relevant scenarios. By leveraging synthetic or historical data to create simulated environments, students can acquire advanced skills like causal inference and real-time decision-making through hands-on simulations.

Lastly, emphasis should be placed on fostering competition and incubation. Actively encourage and guide students to participate in prestigious data science competitions like Kaggle and Alibaba Tianchi, integrating competition topics into the curriculum. Establish a micro-major innovation fund to support student teams with promising business concepts emerging from projects or competitions, facilitating a seamless transition from learning to innovation and entrepreneurship. In essence, this "trinity" platform effectively addresses the challenge of limited practical teaching resources, enabling students to "learn through practice and innovate while studying".

4. Resource-Oriented Approach: Constructing a "dual nature with one degree" Curriculum Ecosystem

Courses are the cornerstone of talent development. Efforts should be concentrated on establishing a digital and intelligent curriculum resource system characterized by "high-level, innovative, and challenging" attributes.

Firstly, teaching content should be upgraded. Course materials should closely follow technological advancements, such as incorporating the applications of Large Language Models (LLMs) in business text analysis and automated report generation. Additionally, beyond theoretical knowledge, teaching content should encompass a wealth of authentic industry cases to aid students in comprehending the practical application scenarios of abstract concepts and bolster their practical skills and problem-solving abilities.

Secondly, teaching methods should be innovated. A comprehensive online-offline blended teaching model should be adopted: core theories are delivered through high-quality Massive Open Online Courses (MOOCs) for self-directed learning, while classroom sessions are dedicated to case discussions, coding exercises, and project guidance to deepen interaction. Concurrently, an AI teaching assistant system should be introduced to offer personalized programming assistance, error analysis, and adaptive learning path recommendations based on learning behavior data, thereby facilitating large-scale individualized instruction.

Thirdly, ideological and political education should be seamlessly integrated into the curriculum. By delving into the narratives behind data, ideological and political education should be organically woven into professional courses to foster students' sense of patriotism and social responsibility. For instance, utilizing macroeconomic data to elucidate the effectiveness of national policies and showcase the data-driven economic boom since China's reform and opening up; explaining the power of data openness through cross-border data flow cases and highlighting the pivotal role of data elements in driving economic development. This natural integration of ideological and political elements not only enriches the curriculum but also elevates students' ideological awareness and overall competence.

Fourthly, course resources should be co-developed. Collaborating with partner enterprises, new textbooks and case libraries in loose-leaf and workbook formats should be jointly created to ensure that teaching content remains abreast of industrial practices, enabling students to directly engage with and resolve real-world problems during their learning journey.

4. Conclusion

In the tide of the digital economy, fostering compound talents who can harness data, gain business insights, and drive decision-making represents the era's mission for higher education in serving national strategies and regional economic development. As a pivotal component in the development of new business disciplines, the micro-major in business data analysis and decision-making derives its vitality from deep integration with technology and industry. This paper proposes a compound talent cultivation pathway characterized by the "interconnection of four chains, three-dimensional collaborative, trinity, and dual nature with one degree". By systematically revamping the cultivation plan, educational team, practice platform, and curriculum resources, it effectively addresses numerous challenges in micro-major construction, offering a feasible practical model for nurturing high-caliber talents in business data analysis and decision-making. Looking ahead, we should further deepen the integration of technology, industry, and education, continuously refine and optimize the cultivation system, and provide robust intellectual support for the construction of a digital China.

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