Application of Project-based Teaching in Graduate Education of Food Majors

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Abstract *Food Enterprise Operation and Management* is a non-degree course for graduate students majoring in Food Processing and Safety at Chengdu University. It aims to help students preliminarily acquire the relevant knowledge and skills of food industry enterprise management, thereby laying a solid foundation for their future development as technical and managerial talents in modern food enterprises. Based on theoretical instruction, the course instructors have collected a large number of real-world cases from food enterprises and integrated them into classroom teaching. The project-based teaching method has been introduced to enhance teaching effectiveness and student participation and guide students to deeply understand the operational logic of enterprises from a management perspective, thereby helping to cultivate more interdisciplinary talents who meet the development needs of the industry.

Key words Project-based teaching; *Food Enterprise Operation and Management*; Graduate education

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Food Enterprise Operation and Management is a non-degree course for graduate students majoring in Food Processing and Safety at Chengdu University, with a total of 32 class hours. This course focuses on the core knowledge and practical skills of food enterprise management. It systematically and hierarchically covers key modules such as food quality management, safety management systems, cost and financial management, warehousing and logistics management, factory design management, marketing management, as well as production, equipment, and material management. The course emphasizes fundamental concepts in food enterprise management, management system certification, cost accounting, economic benefit analysis, business strategies and decision-making, marketing strategies, production and operation control, equipment and material management, new product development, and food safety. The goal is to help students preliminarily master relevant knowledge and skills of food industry enterprise management, thereby laying a solid foundation for them to become technical and managerial talents in modern food enterprises[1].

During the school period, graduate students majoring in Food Processing and Safety at Chengdu University primarily focus on experimental research related to their theses. As a result, they have limited exposure to food enterprises and possess a relatively restricted understanding of current industry developments and the actual operational models of food enterprises. However, after graduation, most of these students will enter food enterprises and engage in product development, quality control, and other related tasks. Without a solid grasp of enterprise business and management knowledge, they may struggle to quickly adapt to the requirements of their positions in the industry. Therefore, based on theoretical instruction, the course instructors have collected a large number of real-world cases from food enterprises and integrated them into classroom teaching. This approach guides students to deeply understand the operational logic of enterprises from a management perspective, helping to cultivate more inter-disciplinary talents who meet the development needs of the industry.

However, it is difficult to fully stimulate students' interest in learning the course content by a single teacher-centered teaching mode. Meanwhile, contemporary graduate students have a strong willingness to express themselves and a high demand for active participation. Based on this, the course has introduced and expanded the use of project-based teaching methods to enhance teaching effectiveness and student engagement.

Current Application of Project-based Learning in Teaching

Project-based Learning (PBL) is a student-centered teaching method that guides students to engage in authentic and complex problem exploration, actively construct knowledge systems through interdisciplinary practice, and ultimately produce demonstrable solutions or practical outcomes. It is a teaching model that emphasizes the cultivation of practical skills and innovative thinking[2]. At present, this teaching method has been widely applied in teaching practices across different educational levels and disciplines, including primary and secondary school subject education[3], labor education[4], undergraduate genetics teaching[5], and graduate ecology education[6]. In higher education settings, PBL can effec-

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tively improve teaching quality, stimulate students' interest and active participation in the course, and promote the development of teamwork spirit. It also enhances higher-order learning abilities such as problem analysis, problem solving, and information synthesis, helping students gain a deeper understanding and mastery of theoretical knowledge, thus laying a solid foundation for the practical application of the knowledge they have learned. Furthermore, this teaching method plays an important role in cultivating high-quality interdisciplinary practical talents, promoting the deep integration of industry, academia, and research, supporting the development of academic disciplines, enhancing students' comprehensive competencies, and serving social and economic development, thereby demonstrating significant educational value.

Application of Project-based Learning in the *Food Enterprise Operation and Management* Course

In this course, students are organized into groups of 2 – 3 to analyze and discuss the operation and management case of a food-related enterprise. Each group is required to prepare PPT and share their analysis in class. Through case study analysis, students learn about the operational and managerial approaches of food enterprises, as well as crisis public relations and propagandizing methods. This teaching method allows graduate students in Food Processing and Safety, while focusing on their scientific research, to also pay attention to specific cases of food enterprise operation and management. It broadens their understanding of food enterprise management beyond the usual focus on foundational and theoretical knowledge such as food processing technology and reaction mechanisms, directing more attention toward practical issues in production conditions and operational management. The cases presented by students covered the operational status of enterprises related to food processing, supply chains, catering, and other sectors, as well as emergency incident handling and enterprise development.

When selecting cases, students analyze the current marketing status and challenges faced by enterprises, and propose certain marketing strategies based on their analysis. For recently popular emerging food enterprises, the focus is on analyzing aspects such as brand positioning, responding to intense competition, ensuring supply chain and financial stability, and summarizing the reasons for their popularity. For traditional well-known enterprises in the industry, the focus is on studying how they protect their brand value, adapt to the needs of new consumers, expand channels, and sustain long-term survival after years of experience accumulation. The business practices worthy of learning and reference are also explored. For case studies on unexpected incidents, attention is given to the causes and consequences of the incident, the management vulnerabilities exposed, the response to external inquiries, and the post-incident handling, including both effective and ineffective measures.

Table 1 Classroom case analysis topics in recent years

No.	Topic
1	Mixue Bingcheng Operation Analysis
2	Operation and Management Analysis of Sichuan Chicken Feather Restaurant
3	Operation and Management Analysis of Mala Prince
4	Operation and Management Analysis of Snack Youming Store
5	Operation and Management Analysis of Lay's Potato Chips (Lay's Food Enterprise)
6	Paris Baguette Case Analysis
7	Operation and Management Analysis of Panpan Food Group's French Little Bread
8	Risk Analysis and Coping Strategies in the Operation and Management of One Yogurt Cow
9	RIO Brand Operation and Management Analysis
10	Coconut Palm Group Operation Case Analysis
11	Intelligent Transformation of Production Management in Haitian Soy Sauce
12	Yuanqi Forest Business Model
13	Starbucks Frappuccino—The Business Legend of Icy Beverages
14	Hygiene Management in Food Enterprises: A Case Study of Chaqi Vegetable Industry
15	Research on Marketing Strategies of Meihao Food in the Context of New Retail
16	Beyond Meat Market Education and B—End Breakthrough
17	Chabaidao Operation and Management Analysis
18	Holiland Operation and Management Analysis
19	Hongqipo Group Operation and Management Analysis
20	Operation and Management Analysis of Fujian Wallace Food Co., Ltd.
21	Liuzhou Dehua Food Co., Ltd.-Haohuanluo Snail Noodles
22	Eastroc Beverage (Group) Co., Ltd.
23	Pangdonglai Operation and Management Analysis
24	Mingyang Hotpot Condiment Operation Case Analysis
25	Youchen Group Co., Ltd.-Youchen Meat Floss Cake
26	Chagee Operation and Management Analysis
27	Research on the Business Model and Market Strategy of Sam's Club in China

Teaching Feedback

During the course teaching practice, the teaching team comprehensively tracked students' learning status and developmental changes through classroom observation, after-class interviews, and analysis of student outcomes. It was found that compared with the traditional "teacher lecturing, students passively receiving" teaching model, the adoption of the PBL teaching method led to significantly positive changes in students' learning initiative, breadth of knowledge, and comprehensive abilities. These changes fully demonstrate the application value of the PBL teaching model in graduate education and provide a solid practical foundation for subsequent teaching optimization.

Students' attention to real-time information in the food industry has significantly increased

The graduate students in Food Processing and Safety participating

in this course come from food-related majors at various universities. During their earlier graduate education, their learning focus is mainly on theoretical and specialized content such as core food processing technologies, food safety control systems, and mechanisms of food chemical reactions. The curriculum and learning direction are largely oriented toward laboratory research and theoretical exploration, resulting in a general lack of understanding of practical information such as real-time dynamics in the food industry, actual enterprise development, the latest changes in consumer markets, and industry policy orientation. This reflects a cognitive bias of "emphasizing theory over practice" and "prioritizing technology over industry". In contrast, the PBL teaching model is oriented toward specific practical industry problems. It integrates a large number of real-world cases from food enterprises into the project design, such as quality control optimization in food production enterprises, marketing strategies for new food products, and public response to food safety incidents. Students are required to actively collect industry-related information, track enterprise development trends, and analyze consumer market dynamics according to the needs of the projects. This approach gradually breaks the limitations of traditional learning, cultivates an awareness of focusing on industry realities and grounding learning in practice, and enables students to closely integrate theoretical knowledge with actual industry conditions, thereby broadening their intellectual horizons.

Students have systematically grasped and understood key concepts of enterprise operation and management, and have developed preliminary business thinking

The food industry is a livelihood industry directly related to the health and well-being of the public. Technological innovation and quality safety are the foundations upon which food enterprises establish themselves, but scientific operation and management constitute the path to sustainable development. The two are mutually reinforcing and indispensable. Graduates of the Food Processing and Safety program will primarily pursue careers in food production enterprises, research institutes, regulatory agencies, and related fields. Most of these students will enter food enterprises, where they will inevitably encounter work related to enterprise operation and management, such as production planning, cost control, team management, and market coordination. In traditional teaching models, such knowledge of enterprise operation and management is often overlooked, leading to a situation where graduates face difficulties in quickly adapting to job requirements when they enter enterprises, resulting in a certain capability gap. In contrast, the PBL teaching model, by assigning projects related to enterprise operation such as "Research on Cost Control Strategies for Small and Micro Food Enterprises" or "Market Positioning and Promotion Plan Design for New Food Products", motivates students to actively consult enterprise management materials, learn basic management knowledge, and understand the fundamental logic and core elements of enterprise operation. Gradually, students develop a mindset that "technology serves operation, and operation supports technology". This not only fills the gaps in their existing knowledge system, but also provides strong guidance for smooth employment and rapid adaptation to job requirements after graduation, thereby enhancing their career competitiveness.

The PBL teaching model has effectively promoted the improvement of students' teamwork skills and met their need for self-expression

One of the core components of the PBL teaching model is collaborative group inquiry. In this course, students are divided into small teams based on project difficulty and individual characteristics. Each team member has a clear role and specific responsibilities. Some are responsible for gathering and organizing project materials, some for case analysis and solution design, some for creating and refining the PowerPoint presentation, and others for on-site presentation and Q&A. Ultimately, team members must collaborate to integrate the various pieces of research into a coherent project outcome, and then present and share their work through a combination of text, images, and a PowerPoint presentation. Throughout this process, interactions among students become more frequent. They not only need to communicate and collaborate to solve various problems encountered in their research, but also work together to complete the presentation of their outcomes. This effectively strengthens their communication skills, sense of collaboration, and sense of responsibility. Meanwhile, the presentation session provides students with a platform for self-expression, allowing them to fully leverage their strengths and showcase their research findings, presentation skills, and logical thinking. This fulfills the psychological needs of contemporary graduate students for self-presentation and self-recognition. Moreover, during the project inquiry process, students need to independently analyze and solve problems. When faced with differing viewpoints and debates, they must engage in critical thinking and rational analysis. This further cultivates their critical thinking skills, problem-solving abilities, and self-management skills, greatly stimulating their interest in the course and active participation, transforming the classroom atmosphere from passive and boring to active and dynamic.

Conclusions

The application of the PBL teaching model in the *Food Processing and Safety* course for graduate students has achieved notable teaching outcomes. From classroom participation and student learning interest to the enhancement of comprehensive abilities, a qualitative leap has been realized. Compared with the traditional teaching model, where instructors give lectures unilaterally and students passively receive knowledge, the PBL teaching model fundamentally transforms the roles of teaching and learning, returning the initiative in learning to the students. It shifts students from a mindset of "being asked to learn" to "wanting to learn." Through independent inquiry, group collaboration, and outcome presentation, it not only deepens students' understanding and mastery of professional knowledge, but also cultivates their practical skills, innovative ability, and overall competence. This aligns with the core goal of graduate education: "to cultivate high-quality, innovative, and practice-oriented talents".

Meanwhile, the PBL teaching model also places higher demands on instructors. Since the course projects are often designed based on real-world cases from the food industry, instructors are required not only to have solid theoretical knowledge and teaching competence in food science, but also to possess a relatively deep

understanding of industry trends, enterprise operation and management, and market changes. They must be able to accurately identify industry hot topics, select appropriate teaching cases, and demonstrate strong project guidance skills to help students carry out their inquiries systematically and solve problems encountered during the research process. The application of this teaching model also encourages instructors to continuously learn, broaden their knowledge boundaries, and proactively enhance their professional competence and teaching guidance skills, thereby achieving a positive outcome of "teaching benefits teachers as well as students".

Of course, there are still some limitations and areas for improvement in the application of the PBL teaching model in this study. Currently, the evaluation of PBL teaching effectiveness is mainly based on qualitative methods such as classroom observation, student feedback, and outcome presentations. There is a lack of standardized and systematic data support, and no detailed, long-term tracking analysis or quantitative research has been conducted on students' learning outcomes or competence enhancement. Furthermore, the influence of different project types and team sizes on the teaching effect has not been fully explored.

In future teaching research and practical application, the teaching team will address the existing shortcomings by further optimizing the PBL teaching model, improving the project design framework, and selecting teaching cases that are more aligned with students' professional characteristics and industry needs. Meanwhile, a scientific and systematic evaluation system for teaching effectiveness will be established, with enhanced long-term tracking of students' learning processes and competence improvement. Through a combination of quantitative analysis and qualitative assessment, the application effects of the PBL teaching model will be comprehensively and objectively evaluated. Furthermore, cooperation with food enterprises will be strengthened to introduce more real-world corporate projects and industry resources, making PBL teaching more closely aligned with the actual needs of enterprises. Continuously exploring teaching pathways suitable for graduate students in Food Processing and Safety and fully leveraging the advantages of the PBL teaching model will provide strong support for cultivating more high-quality professionals for the food industry.

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(Continued from page 79)

students' applied competencies, but also continuously promoted the connotation of professional development. In the future, this model still requires further exploration in areas such as digital empowerment, interdisciplinary integration, and the cultivation of sustainable development capabilities, in order to continuously adapt to and even lead industrial transformation in food engineering education and provide a more solid talent foundation for the modernization of the food industry system.

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