

Research Article

Exploring Case-based Teaching Methods Under the "New Engineering" Background - Using Culinary Hygiene and Safety Course as an Example

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Abstract

"Culinary Hygiene and Safety" is one of the core courses in the culinary and nutrition education major in higher education institutions. Under the current "New Engineering" background, students in this major should possess strong abilities to analyze and solve practical application problems. Therefore, a systematic and efficient teaching model is necessary. This study proposes introducing case-based teaching into this course and analyzes the teaching objectives, teaching content, teaching methods, and assessment methods. It explores a teaching model that facilitates the close integration of theory and production practices, courses, and industrial development. This teaching model aligns with the professional foundation characteristics of different student sources, capable of laying a solid theoretical and practical foundation for students' graduation, further studies, employment, and entrepreneurship. It is recommended that this teaching model be extended to the other courses offered by the College of Food Science and Engineering, thus facilitating the cultivation of applied "new engineering" talents.

Keywords

Culinary Hygiene and Safety, Case-based Teaching, Teaching Model

1. Introduction

"Culinary Hygiene and Safety" is one of the core compulsory courses in the culinary and nutrition education major in higher education institutions, designed to train and examine students' abilities to solve culinary hygiene issues using basic food hygiene knowledge. It is an applied discipline closely integrating theory and practice and tightly connects theory with production. Under the current engineering education background, in our school's culinary major talent training plan, the course "Culinary Hygiene and Safety" supports many important indicator points of graduation requirements. This includes training students' engineering awareness, innovation

consciousness, practical operation skills, and the innovative ability to research and develop new products, playing a significant role in our school's talent training in the culinary and nutrition education major. However, a number of problems persist in the teaching, including an emphasis on theory rather than practice, a lack of hands-on experience, and a lack of timely updating of knowledge, problems that exist in other engineering programs. Case-based teaching has been shown to be effective in addressing these issues by providing practice-based examples [1, 2].

Therefore, this article intends to analyze the teaching ob-

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jectives, teaching content, teaching methods, and assessment methods of the "Culinary Hygiene and Safety" course. With the foundation of case-based teaching, it explores how to perfect the teaching of the "Culinary Hygiene and Safety" course using the construction concept of "New Engineering" curriculum. This optimization aims to foster a closer integration with production practices and industrial development, align with the specialized foundation characteristics of different student sources, and lay a solid theoretical and practical foundation for students' graduation, further studies, employment, and entrepreneurship.

2. Necessity of Curriculum Reform

In the active response to the new round of technological revolution and industrial transformation, in the considerable context of the new economy and new starting point, the concept of "New Engineering" was proposed in the New Engineering seminars held by the Ministry of Education at Fudan University and Tianjin University in February and April 2017 respectively. The proposition of this concept has pointed out the direction for the development of higher education in our country, especially engineering education [3]. "New Engineering" corresponds to emerging industries, emphasizing new structures and new systems. New structures must match industrial development, oriented towards both pressing current needs and future development. New systems promote the organic combination of school education and social education [4]. The "Culinary Hygiene and Safety" course is one of the main professional courses of the culinary, nutrition, and education major, which is a necessary professional literacy for students of this major in the process of culinary and food research and production. Under the background of "New Engineering", the constantly changing catering and food industry forces the course to carry out necessary reforms. The construction concept of "New Engineering" courses lies in innovation, integration, openness, and comprehensiveness. Hence, considering how to optimize the knowledge system and content of the "Culinary Hygiene and Safety" course, expand the applicability and practicality of course knowledge, stimulate students' innovative spirit, train students' open-mindedness, then comprehensively enhance students' abilities to analyze and solve practical application problems, adapt to and facilitate the "new model" development of the current catering industry and food industry, deserves exploration.

The Case-Based Teaching method, originating in the 1870s from Harvard Business School, has gradually become a globally popular and successful educational paradigm considered to represent the future direction of education [5]. This instructional approach, which guides students to think independently through case simulation and re-enactment, proffers the advantage of rendering complex, abstract problems more tangible and concrete [6]. The establishment of the course "Culinary Hygiene and Safety" involves knowledge from a

variety of fundamental and professional courses such as Culinary Chemistry, Food Raw Materials, Food Nutrition, Food Technology, Functional Food, and Catering Management. The theoretical knowledge is complicated and detailed. The Case-Based Teaching method can significantly integrate knowledge points, diverge thinking, enhance classroom teaching efficiency, and achieve the effect of learning for practical application [7].

The rapid changes in the food industry and catering industry require students not only to update their knowledge systems, but also to learn how to apply constant theoretical knowledge to ever-changing practices [8]. Case pedagogy is the most effective and direct method for theory to keep up with the times and maintain timeliness. On May 26, 2021, the Ministry of Agriculture and Rural Affairs's "Guiding Opinions on Accelerating the Cultivation and Development of the Whole Agricultural Industry Chain" emphasized innovating and developing business formats such as direct agricultural and commercial supply, prepared dishes, catering takeout, cold chain distribution, etc., and developing and promoting models such as "raw material base + central kitchen + logistics distribution". On March 25, 2022, the Guangdong Provincial People's Government issued the "Ten Measures to Accelerate the High-Quality Development of the Prepared Vegetable Industry in Guangdong" (Guangdong Government Office (2022) No. 10), which proposed speeding up the construction of a highland with influence in the prepared vegetable industry throughout the country and the world, and promoting the high-quality development of the prepared vegetable industry in Guangdong [9]. The "Ten Rules for Prepared Meals" states that talent training for the prepared vegetables industry should be incorporated into the "Master Cantonese Cuisine" project, vocational colleges (including technical schools) and general colleges should be encouraged to add relevant professional courses, and promote the construction of "industry-university-research" bases for prepared dishes [10]. Driven by the "New Engineering" format, the "Culinary Hygiene and Safety" course should guide students to actively understand and discover market applications, achieve interdisciplinary integration, allow students to understand current trends and industry needs in the catering and food industry, cultivate their professional interests, guide students to study independently, and lay a solid foundation for subsequent course studies.

Thus, under the requirements of a new structure and new system and in the backdrop of the food industry's rapidly evolving new modalities, adopting a case-style teaching method for curriculum reform is essential. By conducting analyses of exemplary cases, principles, methods, and techniques of culinary hygiene can be incorporated into emerging food industries and catering models, quality entrepreneurial education, thereby driving the transformation of talent training from employability education to innovation and entrepreneurial education. This approach aligns with the concept of 'new engineering' and warrants further intensive study.

3. Current Situation Analysis

The course "Culinary Hygiene and Safety" is a compulsory course for the major of culinary, Nutrition, and Education at our university, comprising 48 class hours, including 32 hours of theory and 16 hours of practical sessions. The course is designed for students majoring in culinary and Nutrition Education (Teacher Training) at our university. It is scheduled in the first half of the third academic year, and the prescribed textbook is "Culinary Hygiene and Safety (3rd Edition) (by Jiang Yunsheng)." Since 1986, when the Ministry of Commerce proposed the necessity of incorporating Culinary Hygiene into the curriculum for culinary majors, "Culinary Hygiene and Safety" has become a standard course in vocational colleges and universities. However, only a few undergraduate institutions adopt this textbook, while vocational schools tend to use simpler related materials. Currently, the teaching of this course faces the following main challenges.

3.1. The Course Content Is Highly Theoretical, There Are No Practical Examples, Students Lack Practical Experience

The textbook "Culinary Hygiene and Safety" consists of three sections. The first section covers the basic theoretical knowledge of food hygiene, focusing on common contaminants in food (biological, chemical, and physical hazards) and their prevention and control. The second section discusses the entire process of food and beverage service from "farm to table," including raw materials, initial processing, processing, and restaurant service, emphasizing hygiene and safety. The third section delves into hygiene management in catering enterprises, introducing advanced hygiene management systems and methods. Moreover, the content of the second section primarily focuses on specific hygiene operational requirements at each stage, aiming to prevent or reduce food-borne illnesses or spoilage caused by contaminants (biological, chemical, and physical hazards). It vertically integrates the theoretical knowledge from the first section into the catering process. Therefore, a comprehensive understanding of the foundational knowledge in the first section is essential for effectively studying the content in the second section. However, due to a large proportion of liberal arts students in this major with weak theoretical foundations, more class hours are allocated to teaching the fundamental knowledge in the first section, while the practical content of the second section receives less emphasis. Reducing the teaching time for the basic knowledge in the first section would leave students unable to form a complete theoretical knowledge system, hindering their comprehension of the content in the second section. Although the teaching of the foundational theoretical knowledge in the first section is integrated with the content of the second section, students find it challenging to understand due to the abstract and hollow nature of the integrated second section, especially since the course is set before professional

training, and students lack practical experience. Therefore, a balance needs to be struck between the teaching of theoretical knowledge in the first section and the practical content in the second section to ensure that students have a solid theoretical foundation and can comprehend the practical aspects of the course.

3.2. Theoretical Knowledge Is Updated Quickly, and Textbooks Are Not Updated in a Timely Manner

Food safety is a focal point of public concern. With a plethora of issues related to food safety and the constant strengthening of national supervision, new sources of pollution, detection methods, and regulatory means are being introduced regularly [11]. Yet, curricular textbooks struggle to keep pace with these changes. Take, for instance, QS certification, which has gone through three transitions from "Quality Safety" to 'Production License' to the cancellation of its mark, while textbooks still retain the earliest interpretation of it being "Quality Safety". Likewise, while GMP and HACCP were the most advanced food business management systems a few years ago, more recent certifications like JAS, EOS, NOP, and others have emerged and necessitate the students' timely comprehension. These pieces of new information can be promptly observed and obtained through cooperation with industry businesses and case analyses.

3.3. The Experimental Content Settings Are Not Practical Enough

Presently, the course encompasses a total of 16 laboratory hours, accommodating five experiments. These contents generally align with the syllabus and include the identification of freshness and spoilage (detection of volatile basic nitrogen in fish, meat, eggs, and their preparations, and detection of adulteration in milk), detection of physicochemical contaminants in food (rapid determination of formaldehyde in food, detection of pesticides in vegetables), as well as a HACCP case analysis in the food safety management system. However, the experimental setup emphasizes theory over practice, failing to underscore the distinction between culinary and food sciences. It lacks the safety control contents in the culinary process.

3.4. The Lecturer Lacks Production Experience

The "Culinary Hygiene and Safety" course has always been taught by me. My background is a master's degree in nutrition and food hygiene and a doctorate in biochemistry and molecular biology, with medical and scientific backgrounds respectively. There is a systematic comparison of theoretical knowledge, but there is a lack of practical experience in food or culinary production. Although attention is paid to combining practice and life cases during the course,

there is still a sense of lack of ambition during project teaching and case studies, and there is still a need to improve applicability in course assessment. The disconnect between teachers and production practices leaves a certain gap between students' job qualifications and abilities and the requirements of enterprises.

3.5. There Is a Big Difference in the Base of Different Student Sources

In 2021, the major of culinary Nutrition and Education has added two new sources of students: those from secondary vocational schools (referred to as the "3+2" program) and those transferring from vocational education to undergraduate education. Combined with the existing sources, including adult higher education, specialized certificate programs for vocational school graduates, and the international program, the major now embraces a total of five types of students: secondary vocational, associate degree, regular high school,

adult higher education, and international. Students from secondary vocational schools and those with associate degrees possess practical advantages due to their strong skills foundation, but they may have weaker theoretical knowledge. Conversely, regular high school students demonstrate strong theoretical knowledge but lack practical experience. As a result, these five types of students have significant differences in their educational backgrounds and each possesses unique strengths. Therefore, it is urgently necessary to adjust the curriculum system, teaching methods, and assessment approaches based on the characteristics of each group of students.

4. Specific Reform Content

The following six pathways, along with the implementation plan in Figure 1, will be used to reform the "Culinary Hygiene and Safety" course.

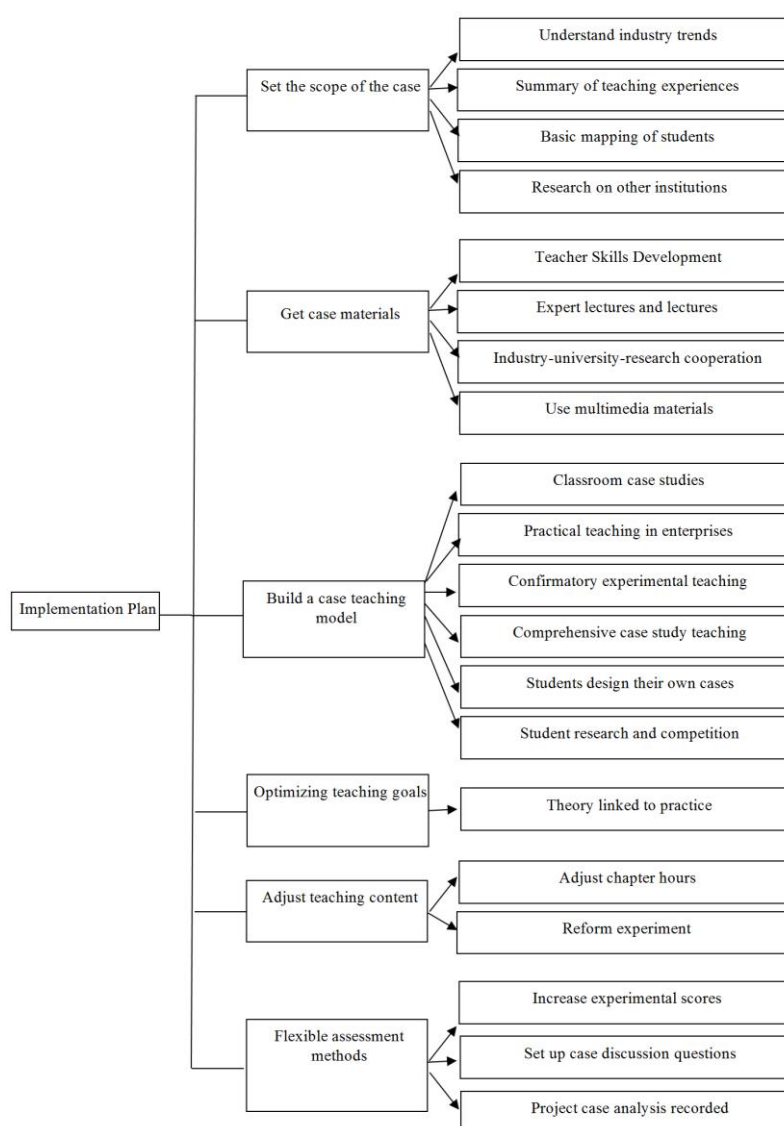


Figure 1. Implementation Plan.

4.1. Improve Teaching Goals and Highlight the Practical Application of Theoretical Knowledge Through Case Teaching Models

In alignment with the hands-on and applicable characteristics of culinary and nutrition education, guided by market demands, and leveraging the existing resources and local attributes of our institution, the course should distinctly emphasize its relevance in the catering industry. This will allow the graduates of this course to develop ventures that diverge from similar food engineering programs, thereby enhancing their market adaptability and competitiveness [12]. At present, the course aims to equip students with fundamental knowledge regarding food hygiene, safe food preparation and culinary process, and familiarity with the sanitary management requirements of the catering industry. The teaching focus is on mastering the prevention and control methods of biological and chemical contamination in food, food poisoning, foodborne diseases, and parasitic diseases. The challenge lies in ensuring the safety of culinary ingredients and culinary processes and converting these measures into methods of restaurant hygiene management. Therefore, given the backdrop of the new engineering education, the emphasis should transition from mastering basic theoretical knowledge of food hygiene to applying that knowledge in creating sanitary and safety measures for the catering industry. The focus should shift from a superficial understanding to a profound application. The educational objective should be revised to master how to establish comprehensive food safety management measures from personnel, processing equipment, raw materials, food safety control technologies, and environmental aspects and their implementation monitoring. This includes basic management systems, food safety management methods, prevention and disposal of food safety accidents, features, and management requirements of various types of catering service units. This pedagogical objective distinctively differentiates it from the educational objectives of food engineering, accentuating catering.

4.2. Update Teaching Content in a Timely Manner and Focus on Cross-integration

During the instructional process, we should remain abreast with the novel trends in current catering and food industries, promptly updating theoretical knowledge and experimental contents of the course [13]. For instance, we should purposefully underscore the theoretical and practical contents related to food hygiene and safety in relevance to the pre-preparation food process; broaden the knowledge points regarding food processing and storage technology; students are expected not only to master the hygiene requirements related to the process but to comprehend the mechanisms and controls involved with process-related quality formation and corresponding theories. Simultaneously, we should steer

students to establish connections with related courses in nutritional science, functional food studies, and flavor science, spurring them to engage in systemic thinking about the new forms and categories of pre-prepared foods, functional pre-prepared meals (medicinal meals), and the selection and cultivation of ingredients. In addition, we must substantially reform the experimental parts of the course, introducing case studies, hands-on exercises, and case design activities.

4.3. Enrich Teaching Methods, Build Case Teaching Models, and Emphasize Open Guidance and Thought Training

The teaching method is the focus of the teaching reform of the “Culinary Hygiene and Safety” course and is the key to implementing the teaching goals and adapting the teaching content. Construct a case teaching model, and construct a teaching model of “classroom case teaching - enterprise case teaching - verification experimental teaching - comprehensive case analysis teaching - students design their own cases - the multi-dimensional practice of scientific research, innovation, and competition” [14]. In classroom case teaching, the case studies should be “advanced” and “innovative”, and emphasize research teaching methods rather than indoctrination teaching methods. In teaching, unidirectional education is transformed into two-way or multi-directional interaction, encouraging students to find cases around them, analyze cases, and increase interaction; motivate students to think independently and generate “question marks” on cases, such as analyzing common phenomena or processes in life or production, proposing why, and then linking theory to further change the “question mark” to a “stop.” Case studies are required to cover theoretical foundations, focus on students' thinking training, guide students to use theory in textbooks to solve practical problems, and cultivate students' comprehensive ability to solve complex problems and logical thinking ability [15]. For middle school vocational or special insertion students with poor theoretical foundations, innovative and interactive cases of varying difficulty are presented, teaching according to their abilities, motivating students to continuously explore issues from lower to higher levels, guiding them to consult the literature, and supplementing their shortcomings in knowledge. Students are also encouraged to innovate in processes based on existing cases, raise personal questions, and cultivate students' ability to innovate in a personalized manner.

4.4. Adopt a School-enterprise Joint Training Model to Obtain the Latest Production Practice Cases and Case Analysis

Under the backdrop of the new engineering education, undergraduate education in culinary and nutrition aims to furnish society with innovative and creative applicants [16]. To achieve this in a manner conducive to innovation, entre-

preneurial education, and the evolving societal demands, the cultivation of practical talents becomes immensely crucial [17]. The objective of joint school-enterprise training is to orient actual teaching towards social demands [18]. Currently, this major has signed industry-university-research collaboration agreements with several related companies, thereby facilitating students' field research and production line visits. These companies include Zhanjiang Swire Coca-Cola Beverage Limited, Guangdong Golden Brilliant Food Limited, Zhanjiang Yantang Dairy Limited, Zhanjiang Union Aquatic Products Development Corporation Limited, Zhanjiang Pearl River Beer Limited, Guangdong Rainbow Aquatics Development Corporation Limited, and Guangdong Kitchen Country Food Limited. They encompass areas such as hotel dishes, sour beverages, dairy products, meat products, aquatic products, beer, and tropical fruits, covering research and development, processing, and preservation. This set-up provides students with the opportunity to observe, learn and even operate on-site. In teaching, course instruction can be effectively integrated into the corporate production process, using company instances for case studies. For instance, while discussing the knowledge point of food freshness preservation period, the different preservation periods of different Yantang milk products can be used as a case study, analyzing the basis for setting preservation periods, management strategies, and improvement measures. Even corporate culture could be incorporated into the learning scope, enhancing practical teaching, and integrating the cultivation philosophy of new engineering talents into practical teaching.

4.5. Encourage Course Teachers to Connect with Enterprises and Industry, Hire Industry Experts to Teach Some Courses

Currently, the host of this project has completed a six-month professional skills training at Guangdong Jinhuihuang Food Co., Ltd. Encourage more teachers to go to enterprises such as factories, hotels, and restaurants for permanent training, organize visits to off-campus internship bases from time to time, improve teacher standards, and invite enterprise technical experts or business executives to participate in curriculum design to help young teachers grow rapidly [19].

4.6. Strengthen the Practical Assessment of Courses to Improve the Assessment Effectiveness

Map out the basic professional characteristics of different students, formulate teaching content and assessment methods appropriate to their fundamentals, and improve students' learning effectiveness. Change traditional course assessment methods and strengthen integration with production practices [20]. At the time of assessment, increase the score of the experimental section, record classroom case studies into regular results, reduce purely theoretical questions, and add compre-

hensive case discussion questions in the final exam paper.

5. Conclusion

The above teaching model, which focuses on case studies, will effectively solve the problem of lack of practical ability faced by students after graduation, and can better tap students' potential, guide students to quickly master vocational skills and understand professionalism, and is worthy of implementation and promotion. In the future, we can conduct further exploration and practice from the following aspects: how to further strengthen the compatibility between case design and professional courses to make case teaching better serve professional teaching and improve students' professional qualities; how to establish a more scientific and reasonable evaluation system to conduct comprehensive and objective evaluations of the teaching effects of case – base teaching; with the application of new technologies such as artificial intelligence and big data in the food industry, how to integrate the training of these new technologies into case - base teaching to enable students to have the ability to adapt to the future development of the food industry.

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Conflicts of Interest

The authors declare no conflicts of interest.

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