



PEDAGOGICAL MECHANISMS FOR THE SYSTEMATIC ORGANIZATION OF LABORATORY AND PRACTICAL TRAINING IN FOOD TECHNOLOGY STUDENTS

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ABSTRACT

This article analyzes the pedagogical mechanisms for systematically organizing laboratory and practical training for students in the field of food technology. Modern educational trends, including Problem-Based Learning (PBL), peer-teaching methodologies, immersive technologies, and production-integrated approaches are examined through the lens of international experience. Special attention is paid to developing safety culture in laboratory design, assessment mechanisms, and interdisciplinary integration.

KEYWORDS: Food technology, laboratory training, problem-based learning, pedagogical mechanisms, practical skills, professional competence.

INTRODUCTION

Training qualified specialists in food technology requires not only theoretical knowledge but also solid practical preparation. The modern food industry needs personnel capable of managing complex technological processes, ensuring product quality and safety, and developing new products. This need makes it urgent to develop effective pedagogical mechanisms for systematically organizing students' laboratory and practical training. A pedagogical mechanism is understood as an integrated system of methods, tools, and forms aimed at achieving educational goals. In food technology education, these mechanisms should serve to form students' professional competencies and prepare them for independent research and production activities.

1. Organizing Laboratory Training Based on Problem-Based Learning (PBL)

Problem-Based Learning (PBL) is one of the most effective pedagogical mechanisms for organizing laboratory training for food technology students. The experience of the Jember State Polytechnic (POLIJE) in Indonesia demonstrates interesting practices in this regard. At this institution's "Teaching Factory" (TEFA) laboratories, students study pasteurized milk and yogurt production processes through complete scenario-based learning.

In the PBL approach, students learn by solving real production problems. When studying the pasteurization process, students not only control temperature regimes but also analyze factors affecting raw material quality, technological equipment operating principles, and finished product shelf life. In yogurt production sessions, by studying the influence of microbiological processes on product structure and taste, students develop scientific thinking and independent problem-solving skills.

2. Peer-Teaching Methodology



Traditional "recipe-based" laboratory sessions often limit students' independent thinking. The peer-teaching methodology developed by researchers at Technological University Dublin (TU Dublin) aims to address this issue .

In this approach, students are divided into groups, with each group tasked with deeply studying a specific laboratory exercise and then teaching it to other group members. Researchers note that this methodology offers several important pedagogical advantages:

Research skills – students thoroughly analyze laboratory work before performing it, learning to anticipate potential problems;

Academic writing skills – while preparing educational resources, students develop scientific writing competencies;

Communicative competence – explaining concepts to others improves oral speech and presentation abilities;

Organizational and planning skills – working in groups and distributing tasks develops management competencies.

3. Production-Integrated Educational Models

The University of Bologna (Italy) offers supplementary laboratory experiments within food quality and formulation sciences. This course aims to develop students' advanced operational skills in product design and formulation, focusing on chemical, physical, microbiological, and sensory quality characteristics. According to students, such an approach helps them understand the practical significance of the science and apply theoretical knowledge in real life. Each group prepares a presentation and report on the enterprise they visited .

4. Mechanisms for Forming Safety Culture

Compliance with safety rules in food technology laboratories is important not only for students' personal safety but also for their future professional activities. The University of Bologna experience pays special attention to forming safety culture .

At the university, all students must complete a three-module safety course before accessing laboratory sessions. Specifically, Modules 1 and 2 are delivered through e-learning, while Module 3 includes special practical training on workplace health and safety .

5. Interdisciplinary Integration and Systematic Approach

Food technology is inherently interdisciplinary, combining elements of chemistry, biology, microbiology, engineering, and other sciences. Therefore, ensuring interdisciplinary integration in organizing laboratory training is crucial.

Imperial College London's "Chemical Kitchen" project offers an innovative approach in this regard. Within this project, students learn fundamental chemistry laboratory skills through culinary processes. Through cheese-making, precise temperature cooking of eggs, and molecular gastronomy techniques, students develop skills in handling laboratory equipment, observation, and planning .

According to research findings, this approach significantly increases confidence, particularly among students with limited prior laboratory experience, and reduces knowledge gaps within groups. This effect, termed "leveling the playing field," represents a significant achievement of the project .

CONCLUSION

Analysis of pedagogical mechanisms for systematically organizing laboratory and practical training for food technology students reveals several effective approaches in modern educational practice: Problem-Based Learning (PBL) develops students' ability to apply theoretical knowledge in practical situations and enhances critical thinking skills. Peer-teaching methodology effectively develops students' research, communicative, and organizational competencies. Immersive technologies and virtual laboratories enable safety culture formation, remote familiarization with laboratory equipment, and modeling of hazardous situations. Production-integrated education aligns students' professional preparation with real labor market requirements. Comprehensive assessment mechanisms enable objective evaluation of student knowledge and skills while ensuring timely feedback. Interdisciplinary integration fosters systematic thinking and develops students' ability to solve complex problems.

REFERENCES

1. Politeknik Negeri Jember. (2025). PBL Session on Yoghurt Production
2. Università di Bologna. (2025). C7861 - INTEGRATIVE LABORATORY ACTIVITIES
3. Imperial College London. (2025). Chemical Kitchen: Reimagining Laboratory Education Through Gastronomy
4. Politeknik Negeri Jember. (2025). PBL Session on Pasteurized Milk Production Launched at TEFA Milk
5. Garcia, R., et al. (2023). Immersive technology for food science education: digital twin laboratory, safety and experimental modules for practical works
6. Université Aboubakr Belkaïd de Tlemcen. (2025). Mini Project S2 2025
7. Guangdong Technion-Israel Institute of Technology. (2026). At GTIIT, Encountering Classrooms That Make Knowledge "Land"
8. Technological University Dublin. (2013). Peer Teaching: Taking the Recipe out of Food Analytical Chemistry

