

Problem-Based Learning in University Chemistry: Designing a Laboratory Script for Beer Alcohol Content Determination

M. Mar López Guerrero
University of Malaga, Spain

Pablo Montoro Leal
University of Malaga, Spain

Elisa Vereda Alonso
University of Malaga, Spain

Gema López Guerrero
University of Malaga, Spain

Abstract:

This study presents a Problem-Based Learning (PBL) approach to enhance engagement and understanding in university-level chemistry education. The proposal is centered on the design of a contextualized laboratory activity in which students develop a complete experimental script for determining the alcohol content of beer. Framed as a real-world problem, students are tasked with selecting appropriate analytical methods, designing procedures, and justifying their decisions based on chemical principles.

Through this process, learners actively connect theoretical concepts—such as fermentation, density, and solution properties—with practical applications. The PBL framework encourages students to take responsibility for their learning, promoting autonomy, critical thinking, and collaborative problem-solving. Rather than following predefined instructions, students construct their own methodologies, evaluate possible sources of error, and interpret experimental results.

The activity is supported by digital tools that facilitate access to resources and allow for flexible, personalized learning pathways. Preliminary observations suggest increased student motivation, deeper conceptual understanding, and improved scientific reasoning skills.

This proposal demonstrates the effectiveness of PBL in creating meaningful, student-centered learning experiences in chemistry, particularly when applied to authentic and professionally relevant laboratory challenges.

Keywords:

ICT, learning sciences, multimedia applications, PBL, higher education, chemistry.