Today, we produce about 400 million tonnes of plastic waste every year. Less than 10 per cent of the waste generated globally has been recycled.

What is Problem-Based Learning? Problem-based learning (PBL) is a student-centred approach to learning in which students work in groups to solve open-ended problems in real-life scenarios.

What are the benefits? Literature precedents indicate that PBL enables students to develop practical chemistry skills, resulting in increased participation and engagement.

A Relatable Challenge

The teams work on the optimisation of a method for the conversion of waste polystyrene into a sulfonated functionalised polymer.

Students are provided with a sample of polystyrene (polystyrene cup) which they will use to:
- Optimise the parameters (time, temperature, particle size…) of the conversion of waste polystyrene into a functionalised polymer.
- Characterise the new materials (degree of sulfonation, wettability, ion-exchange capacity…)
- Devise an application that they will have to pitch to a group of investors (team of educators) in a Dragons' Den format.

How does it work?

A three weeks mini research project supported by recorded lectures and Tutors trained in PBL

Real-Life Scenario of the Case Study

“Students are part of a team of chemists and materials scientists working in a start-up company that develops processes for plastic recycling. The teams work on the optimisation of a method for the conversion of waste polystyrene into a sulfonated functionalised polymer.”

Objectives

Students are provided with a sample of polystyrene (polystyrene cup) which they will use to:
- Optimise the parameters (time, temperature, particle size…) of the conversion of waste polystyrene into a functionalised polymer.
- Characterise the new materials (degree of sulfonation, wettability, ion-exchange capacity…)
- Devise an application that they will have to pitch to a group of investors (team of educators) in a Dragons' Den format.

Assessment Profile

- Group Mark: Initial Research Plan 20%, Final Presentation 40%, Report. 40%.
- Final Students’ Individual Mark
  - Individual Mark = (Peer Assessment Scaling factor x Group Mark)

Challenges

- Resources. PBL is “expensive”. Staff availability, Lab space, Equipment.
- Consistent support by well-trained tutors that act as facilitators and can motivate and guide students.
- Group work dynamics and Peer Assessment.