Teaching –learning module compiled by the PARSEL consortium
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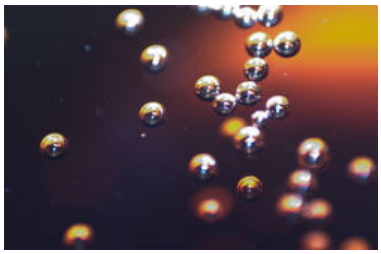
Popularity and Relevance of Science Education for scientific Literacy

The gas we drink - Carbon dioxide in carbonated beverages

A grade 10-11 science (chemistry) module on
Carbin dioxide, its properties, and use in beverages



Abstract:

Soft drink chemistry and physics is studied in this module. Bottled or canned carbonated beverages provide real-life applications of science. Gas solubility in liquids, gas pressure, gas laws, physical and chemical equilibrium, and acid–base chemistry can be covered. Students work collaboratively in groups and propose and then perform in the laboratory methods first to measure the volume of carbon dioxide contained in a beverage, and secondly to determine the pressure that prevails inside the unopened bottle or can. Finally, the teacher will perform a carbon-dioxide fountain demonstration, and the explanation of the phenomenon will be discussed.

Sections included		
1.	Student activities (for the students)	Describes the learning scenario in more detail and the tasks the students should perform
2.	Teaching guide	Suggests a teaching approach
3.	Assessment	Gives suggested formative assessment strategies
4.	Teacher notes	Extend the chemistry and physics of carbon dioxide and gases.

Developers: Georgios Tsaparlis & Constantinos Kampourakis
Institution: Department of Chemistry, University of Ioannina
Country: Greece

Overall Objectives/Competencies: The students are expected to:

1. Get to know that gases dissolve in liquids, and study the dissolution of carbon dioxide in water.
2. Realise that carbonated beverages are under high pressure.
3. Working in groups, propose and execute a method for determining the amount of carbon dioxide that is contained inside a carbonated beverage.
4. Devise methods for estimating the pressure inside a sealed bottled or canned carbonated beverage.
5. Apply the ideal-gas equation in the estimation of the above pressure.
6. Consider the experimental errors that enter in various procedures for estimating the pressure.
7. See a demonstration of a "carbon dioxide fountain" and explain it using the knowledge gained through the previous investigations.

Competences: Investigative skills, manipulative skills, cooperative-work skills, concept understanding, theory development and application, experimental-error analysis, communication skills.

Curriculum content: Chemistry, physics.

Kind of activity: Group work in the lab (in groups of 3-5) students.

Anticipated time: 5-6 teaching periods at school, plus pre-activity preparation at home.

Prior Learning: Properties of gases, gas laws, ideal gas law.

This unique teaching-learning material is intended to guide the teacher towards promoting students' scientific literacy by recognising learning in 4 domains – intellectual development, the process and nature of science, personal development and social development.

Its uniqueness extends to an approach to science lessons which is designed to be popular and relevant. For this the approach is intentionally from society to science and attempts to specifically meet student learning needs.

This uniqueness is specifically exhibited by:

1. student-centred emphasis on scientific problem solving, encompassing the learning of a range of educational and scientific goals;
2. including socio-scientific decision making to relate the science acquired to societal needs for responsible citizenship.

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