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

# Should Zero Emission Cars be Made Compulsory – Is It Feasible?

A grade 8-9 science (chemistry) module on
Hydrogen and Fuel Cells

## Abstract:

This set of activities allows students to consider factors which need to be considered if a car is to give zero emission (or the emission of water vapour only). The module is planned so that students suggest the scientific learning they need to understand about hydrogen and how fuel cells have a potential advantage over hydrogen itself, once the technology has been developed. The discussion centres around the feasibility of a zero emission car given the many social factors involved and the properties of hydrogen.

| Sections included | | |
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| 1. | Student activities (for students) | Describes the 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's notes | States the theoretical physics and gives the expected calculations |

**Developer: Ingo Eilks, Spyros Evlogimenos, Charitos Olympios and Nicos Valanides**
**Edited by: Jack Holbrook**
Institution: ICASE
Country: UK

**Objectives/competencies:** Students are expected to be able to**:**

1. Putting forward scientific questions to guide learning about hydrogen
2. Deciding whether zero emission cars should be made compulsory.
3. Understanding the socio-scientific manufacture, properties and uses of hydrogen.
4. Putting forward procedures, based on literature and other sources, for the preparation and testing of the properties of hydrogen.
5. Promoting communication and cooperation abilities by students working together to develop procedures, carry out tests and in the sharing of experiences and understanding to other groups.
6. Developing an understanding of the functioning of a fuel cell
7. Gathering and evaluating information on the exhaust of fuel engines and electricity production for electric cars.
8. Recognising all engines give emissions and that the hotter the temperature, the more the production of oxides of nitrogen become a problem.

**Curriculum content:** Hydrogen, fuel cells.

**Kind of activity:** Devising the means of preparing hydrogen and realizing its properties; undertaking electrolysis as a means of preparation of hydrogen and operating a fuel cell as opposite of electrolysis; group decision making on the feasibility of zero emission cars**.**

**Anticipated time:** 5 lessons

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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. a society related and issue-based title (supported in the student guide by a scenario);
2. student-centred emphasis on scientific problem solving, encompassing the learning of a range of educational and scientific goals;
3. including socio-scientific decision making to relate the science acquired to societal needs for responsible citizenship.

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