



Teaching –learning module compiled by the PARSEL consortium
as part of an EC FP6 funded project (SAS6-CT-2006-042922-PARSEL) on
Popularity and Relevance of Science Education for scientific Literacy



UNIVERSITY OF TARTU



UNIVERSIDADE DE LISBOA



LUNDS UNIVERSITET

Freie Universität Berlin



UNIVERSITY OF IOANNINA

Should Vegetable Oils be used as a Fuel ?

A grade 10-12 science (chemistry) material on
making and testing Biodiesel as a Fuel



Abstract

This module explores the ethical dilemma in using edible substances as fuels. In this aspect the problem did not arise because vegetable oils were too viscous to be used in standard engines. But by a process of exchanging the ester components the oils are made into a substance resembling diesel and have less polluting properties. This module explores the making of biodiesel and its suitability as a fuel before trying to decide whether it is appropriate in this day and age of high costs of diesel to use vegetable oils as a source of fuels.

Sections included		
1.	Student activities	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 notes	Gives background information and student worksheet on making biodiesel.

Developer: Jack Holbrook (based on Supplementary Teaching Materials (eds) Jack Holbrook and Miia Rannikmae, ICASE, 1997)

Institution: International Council of Associations for Science Education (ICASE)
Country: UK



Overall Objectives/Competencies: The students are expected to:

- ability to put forward socio-scientific reasons on the merits and demerits of using vegetable oils as fuels and formulate a justified decision;
- able to follow procedures to prepare bio-diesel experimentally using a commonly available vegetable oil;
- able to plan and devising procedures for testing the suitability of the bio-diesel created; carry out and interpret experiments to determine the suitability of bio-diesel as a fuel;
- explain the manner in which diesel and biodiesel are able to act as fuels in an internal combustion engine, suggest how the suitability of a fuel can be determine and suggest parameters for deciding on the 'best' bio-diesel;
- cooperate as a team member in the carrying out of the experimental procedures, devising tests for determining the suitability of the bio-diesel created and in discussing the merits and demerits of using vegetable oils as fuels;
- communicate orally by putting forward justified reasons for the decision of whether bio-diesel should be used as a fuel;
- understanding the formation and hydrolysis of esters and be able to contrast this with the trans-esterification of esters.

Curriculum content: Esters (consolidation), esterification (consolidation), biodiesel, non-aqueous catalyst, calorific value of fuels.

Kind of activity: Following an experimental procedure, preparing biodiesel; developing separation techniques, planning and carry out investigations on calorific value, participating in a debate on whether vegetable oils should be used as fuels.

Anticipated time: 5 lessons

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.

Developer: Jack Holbrook (based on Supplementary Teaching Materials (eds) Jack Holbrook and Miia Rannikmae, ICASE, 1997)

Institution: International Council of Associations for Science Education (ICASE)

Country: UK