



PARSEL teaching –learning materials compiled by the consortium  
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# How can we avoid energy losses in our school? (Teachers)

## Subject

With this task, students are supposed to investigate how their own school should manage energy use, in order that the school remains warm during the winter and cold during summer time.

## Objectives

Excessive energy waste is a fact. So it has become extremely important to sensitize students about the need to manage energy consumption in a sustainable way, in order to protect environmental costs. So, this task's main goal is to improve the process of decision making and to promote the sharing of ideas amongst the students, by solving a problem related to energy losses at school and how to render it more energetically efficient. After performing this activity, it is expected that students become alert in what concerns energy waste and sustainable energy use.

## Competences

Development of substantive knowledge – whenever the student has to analyse daily problematic situations related to energy use and to interpret energy transference in everyday situations

Development of processual knowledge – whenever the student has to identify a problem and possible ways of solving it and whenever he/ she has to make research about different sources of energy

Development of epistemological knowledge – whenever the student has to relate energy to technological and scientific evolution, taking into consideration each time period constraints and existing knowledge

Development of reasoning competencies – whenever the student has to make inferences and deductions from evidences related to energy, whenever he/ she has to reformulate the group's initial plan and

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Developers: Galvão, C., Reis, P., Freire, A. e Oliveira, T. (2006). Avaliação de competências em ciências: Sugestões para professores do ensino básico e do ensino secundário. [Competence evaluation in science. Suggestions for basic and secondary education teachers]. Lisboa: ASA.

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critically justify it; and whenever he/ she has to relate different knowledge domains in order to make decision concerning the original problem

Development of communicational competencies – whenever the student has to argument and to defend his/ her ideas and whenever he/ she has to hear to and to question his/ her peers ideas

Construction of responsibility and respect attitudes in relation to energy use, that will allow the student to reflect upon concrete situations and to make decisions that promote energy saving.

## Overview

The task's main goal is to improve the process of decision making and to promote the sharing of ideas amongst the students. In developing one such task there are many phases the students have to go through. Firstly, it is necessary to identify one problem, then to analyse it and to balance advantages and disadvantages with different solutions and, finally, to make a well-grounded decision in order to solve it. By going through these different phases - conceiving a problem solving project, planning it out and developing it, students can develop various competencies. That is why it is so important that all students do to participate in all the phases of the project: from the original idea to its implementation. Also, they will get engaged with the project, will develop a sense of ownership over it and, as such, will be willing to conclude it. Despite their engagement with the project, students should have orientation from the teacher; and the younger the students, the more in the need for orientation. The present task can be developed with students from ages 12 to 15, who are able to undertake some autonomous work.

## Task description

With this task, students are supposed to investigate how school manages energy use, in order that the school remains warm during the winter and cold during summer time. For that the teacher presents one problem that can be formulated as presented next: How can we avoid energy losses in school?

In the beginning of the Project, all students should discuss about which goals they want to reach and how they can solve the presented problem. All students should participate in the discussion, suggesting ongoing paths, pointing research problems and how they can be organized. The teacher (or one student) should write down each idea on the blackboard. This discussion, despite might look chaotic, is an important phase in the process, as it may allow the selection of concrete and feasible questions, of possible paths and ways to solve the problem. Often, one can draw one general schemata for exploring the original problem.

## Procedure

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Next we give a tip of a possible development. We might want to divide the school according to different sectors, to make easier the research and also more extensive. It could be important to have the school plan or a school drawing. Then we could assign each group with a school sector (for instance, dining-hall, resource centre, classroom).

1. Compose groups of five elements.
2. Allocate each group with a school sector.
3. Each group has to identify and to point, either on the school plan or school drawing made by the students themselves, all the places and “equipments”, from where energy losses or gains might occur, during winter as during summer. For instance: doors, windows, radiators, chimneys. All sources of energy, energy types and/ or energy transferences should be described.
4. Based on information collected from the websites, each group has to suggest a number of well-grounded, possible actions (hypothesis) for reducing energy transference, in order to reduce energy losses during the winter and energy gains during the summer. In suggesting an action, students have to consider several factors and to balance between desirable actions and possible ones. For instance:
  - Size of the studied sector and medium number of frequent users;
  - School place in relation to climatheric conditions;
  - Windows’ spatial direction, according to the sun;
  - Windows and doors’ thermic insulator material;
  - School financial resources.
5. Each group has to test some of its hypothesis, by constructing a small scale model of the school (or allocated sector) and by using daily materials. Alternatively, students can test their hypothesis using a room and its own materials and resources.
6. After testing hypothesis, the group will write a report with suggestions and actions required to make allocated sector energetically efficient.
7. Lastly, all groups could work together in developing a pamphlet or a model about ways to render school energetically efficient and could present it to the school community. This pamphlet or model would be a product of all the groups’ suggestions.

## List of useful Websites

The following websites contain a lot of information on energy conservation. Information provided by these (or other sites) should be used by students during hypothesis construction phase.

Energy Conservation in Building and Community Systems – <http://www.ecbcs.org>

European Comission Directorate-General for Energy and Transport – <http://www.buildingsplatform.eu>

Green Building – <http://www.eu-greenbuilding.org/>

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## Population

7<sup>th</sup> – 9<sup>th</sup> grades

## Curriculum context

Physics and Chemistry Sciences; Natural Sciences (Biology and Geology).

## Kind of activity

Problem solving + project work + decision making

## Anticipated time

5 to 6 lessons (40 to 50 minutes each)

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