



Global warming: Experimental study about the effect of accumulation of greenhouse gases in the atmosphere

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The project presented here was developed by fifteen year old students of the Institut Sabadell (Sabadell Secondary School. Spain). The objective of this project was to raise the students awareness' about the problem of climate change, mainly caused by the accumulation of greenhouse gases in the atmosphere.

It is also intended that students use the scientific method as an effective system of troubleshooting and that they use the ICTs (Information and Communication Technologies) to elicit data and process information.

To develop this project, four lessons of sixty minutes each were needed.

The first lesson sets out the role of the atmosphere as an Earth's temperature regulator, highlighting the importance of keeping the levels of carbon dioxide, methane and water steam in balance.

The second lesson is focused on the experimental activity that students will develop in the following lesson. In lesson two, students will present and justify their hypothesis about the experiment. Some theoretical concepts, necessary to carry out the experiment, will also be explained.

The third lesson involves the core of the project, that is the experiment in the laboratory. The experiment consists on performing the atmosphere heating on a little scale. Four different atmospheres are created inside four plastic boxes heated by an infrared lamp. Students work in groups (one group for each atmosphere) and have to monitor the evolution of temperature by means of a temperature sensor (Multilog software).

The first group has to observe the relationship between temperature and carbon dioxide levels increase, mainly caused by the widespread practice of burning fossil fuels by growing human populations. The task of this group is to measure simultaneously the temperature of an empty box (without CO₂) and the temperature of a box with high carbon dioxide concentration. The carbon dioxide concentration is the result of the chemical reaction when sodium carbonate mixes with hydrochloric acid.

The second group's task is similar to the first. Students have to study how the concentration of methane affects the temperature of their atmosphere box.

Similarly, the third group monitors the influence of the water steam (generated by evaporation) on the temperature of their atmosphere box. Results must be carefully analyzed because of possible interferences from water steam.

And finally, the fourth and last group explores the long term effects that the accumulation of greenhouse gases have on the Earth's temperature. As temperature rises, evaporation increases and more water steam accumulates in the atmosphere. As a greenhouse gas, water absorbs heat, therefore the air gets warmer and, again, more water is evaporated.

To develop this project, a previous experiment is needed so that the concentration of carbon dioxide remains constant and water steam levels increase gradually. Thus, the consequences of an uncontrolled increase of temperature can be simulated.

Students' aim is to examine the data elicited from the last step of the scientific method experiment. They have to decide either if the experiment supported their hypothesis and, therefore, they can be regarded as true, or the experiment disproved them and, therefore, they are false.

Finally, in the last lesson, students perform an oral presentation about their experimental results, establishing relationships amongst the different experiments.

All together emphasizes the must of humankind to promote renewable energies.