Classroom implementation 2: Testing CO_2 levels - An experiment about the effects of CO_2 and the quality of air.

In this didactic activity, 14-16-year-old students are aimed at developing a proposal that guarantees a good level of air quality in their classroom based on the design of an experience with automatic data gathering in a mobile device. Students are asked to design and interpret data about the rate of increase of the CO_2 levels in a classroom, from several experiments designed by themselves. Based on scientific evidence gathered, students have to elaborate a model of speed of emission of this gas and to provide a solution for having a good quality of air in their classrooms. Moreover, the purpose of the activity is to develop a vision of science as a discipline close to day-to-day life in students.

Video: https://youtu.be/rFvqu84_qf4

Materials and Equipment

The material needed to perform this activity is:

- Computers with Internet connection (ideally, one per a group of about 4 students).
- CO_2 sensor
- Plastic bags

Instructions/procedure

The activity is divided in 3 parts and 8 sub-sections. Total time length of the proposal is about 5 hours

- First part: In this section, the context and the problem to be solved are presented to the students. Their preliminary ideas regarding a model of speed of CO_2 emission are asked.
  1. Introduction: The students are shown an image of a tunnel with different fans, and are asked to interpret it according to their previous ideas.
  2. What do we know about the air?: This sub-section is aimed at making the students aware about the presence of a gas surrounding us (air), which has weight and volume, as well as the need for a good air quality in their classrooms.
- Second part: In this section, the students are requested to design a series of experiments to collect data about the rate of CO_2 increase in the classroom, as well as to analyze the data gathered and to make a proposal to answer the initial demand.
  3. What do we want to investigate?, in which the guiding questions are posed to the students: “which is the quality of the air we breathe in our classroom? How can we improve it?”
  4. Make a prediction: In this sub-section, the students are aimed at making diverse predictions about how they think the concentration of CO_2 raises with time in their classroom, and to show their scientific ideas behind these predictions.
  5. Design an experiment: In order to gather data to make informed decisions, the students design a series of experiments in this sub-section. Experimental designs are discussed among different groups.
  6. Collection of data: The students collect data and represent them.
  7. Conclusions: Students are asked to analyze and provide an interpretation of the data collected, as well as to answer the initial question.

- Third part: In this final section, the students are expected to use and apply their knowledge to a new situation.
    8. Application: With the results and the developed model, the students are asked to make a proposal to the schools' principal to improve the quality of the air the students breath.

References/bibliography

Carbon Dioxide indoors:
http://www.ncceh.ca/documents/practice-scenario/carbon-dioxide-indoor-air

Why Measure Carbon Dioxide Inside Buildings? By Rich Prill, Washington State University Extension Energy Program http://www.energy.wsu.edu/Documents/CO2inbuildings.pdf

Full description of the activity is available at
https://ddd.uab.cat/pub/recdoc/2017/182125/Dossier_DIATIC-Activitat_sensor_CO2_final.pdf

Contact & Credits

This activity has been developed by the CRECIM (Centre de Recerca per a l'Educació Científica i Matemàtica), a Research Centre of the Universitat Autònoma de Barcelona.

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The video has been developed by the CRECIM and the Catalan Foundation for Research and Innovation.