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ACTIVITY 5

A simulation model of the "Greenhouse effect"

Didactic objectives

Students (after the intervention) should be in a position to:

- comprehend the "greenhouse effect" as a natural phenomenon (C)
- describe the "greenhouse effect" (C,P)
- construct simple simulation models (P)
- identify the similarities (analogies) between the model and the natural system (C)
- measure, treat and present data collected from the model, extrapolating them to the natural system (C,P)
- enhance their own awareness as well as raise the awareness of others on the important positive and negative effects of the "greenhouse effect" (C,E)

Indicative duration

3 didactic hours

School rank

Lower/Upper Secondary School

Relevant school subjects

Biology, Chemistry, Principles of Environmental Sciences, Domestic Economy, Management of Natural Resources, Geography, Computer Science

Materials & Instruments

- 3 containers of adequate size, one with a transparent and one with opaque lids
- three small thermometers (range -20° to +50° C)
- soil from the school yard
- a sheet of paper
- timer
- PC (M.S Office programme)

Instructions

1. Construct a funnel with the sheet of paper and use it to place soil inside the containers.
2. Place the thermometers inside the containers.
3. Close the first and second container with the transparent and opaque lids, respectively.
4. Place all three containers near a window, in order to be exposed to the sun.
5. Record the readings of the three thermometers for 30 minutes, in 5 min intervals.
6. Open the lids of the containers and allow them to stay under the same conditions for 10 min. Record the indications of the thermometers every 2 min for 30 min.
7. Depict the results manually on a graph using different color pencils for each container. Alternatively, you may use a PC in order to make the relevant graphs.
8. Discuss the results and correlate them with natural conditions, including cases of the past "*paleoenvironment*" as well as of recent disturbances of the carbon and nitrogen cycles related to increase of CO_2, N_2O and other greenhouse gases (GHGs).
9. Identify and briefly describe recent anthropogenic activities that enhance the "greenhouse effect". Examine which of them could be replaced by non destructive activities.
10. Explain both the difference and the connection between the "greenhouse effect" and the climate change

If you wish to make the simulation model more realistic you may include in the containers a small glass of water and a small plant. You may use seeds of legumes to obtain a small flora by preparing the model 1 or 2 weeks in advance.

ACTIVITY 7

Photography exhibition

Didactic objectives

Students (after the intervention) should be in a position to:

- present in a coherent visual way an environmental problem (P)
- exhibit characteristic components of the problem and associate them with the root causes (C)
- acquire competences in organizing exhibitions (P)
- acquire competences in the collecting and combining information/data (C,P)
- develop team spirit and work in groups (P)
- become familiar with the use of ICT (P)

Indicative Duration

1 school year

School rank

Lower/Upper Secondary school

Relevant school subjects

Biology, Chemistry, Principles of Environmental Sciences, Art, Management of Natural Resources

Materials & Instruments

- camera
- PC, Internet connection

Instructions

Organize a contest and a photo exhibition on an environmental/sustainable development theme, for instance "*Eutrophication of lakes and/or coastal areas* ", "*Atmospheric pollution*" etc. Each photo to be included in the exhibition related to the illustration of the relevant phenomenon will be accompanied by a short explanatory text. For the interpretation you may ask, if needed, the help of your teacher or an expert.

Remember…..!

A picture equals to a thousand words!

ACTIVITY 8

Role playing/Dramatisation for the use of fertilizers

Didactic objectives

Students (after the intervention) should be in a position to:

- playing roles through which the rights, interests, intentions, behavior and attitudes of others are better understood in trying to reach a consensus (E,P)
- present arguments and suggest related solutions (C,P)

More specifically:

- present the reasons for the need of rational use of fertilizers (C)
- juxtaposing advantages and disadvantages of their use (C)
- relate the consequences of unsustainable use of fertilizers resulting to disturbance of the nitrogen cycle, for instance through eutrophication, increase of nitrates in groundwater etc. (C)

Indicative duration

1 month

School rank

Lower/Upper Secondary School

Relevant school subjects

Biology, Chemistry, Principles of Environmental Sciences, History, Domestic Economy, Management of Natural Resources, Civic Education.

Materials & Instruments

Paper & pencil, tape-recorder, camera

Instructions

Following a documentary presentation (e.g. from the National Geographic on eutrophication) or a TV emission/debate on a critical phenomenon caused by the disturbance of the nitrogen cycle connecting with unsustainable use of fertilizers, students are asked to organize a debate under a round-table format, where the topic will be discussed. Roles will be distributed after a detailed discussion between the students and their teacher.

The roles suggested include:

- **Journalist**: Coordinates the discussion making, eventually, provocative questions.
- **Farmer 1:** Supports the excessive use of fertilizers. In order to increase his production and citing his experience considers that there is no need for special precautions for himself or the environment. More often he does not consult the specialist for the dosage and type of the fertilizer.
- **Farmer 2:** Faces long-term health problems due to inhaled chemicals.
- **Fisherman:** Faces serious economic problems resulting from eutrophication caused by runoff contaminated by fertilizers.
- **Agriculturist:** Promotes the reasonable use of fertilizers, considering the time, dosage and type that is necessary depending on the crop and the necessary precautions.
- **Ecologist:** Strongly supports the exclusion of the use of chemical fertilizers and their substitution by organic fertilization. He emphasizes the problems caused by the disturbance of the nitrogen cycle in the environment and he calls for ban of chemical fertilizers.
- **Chemist:** Promotes the movement of green chemistry as a tool for sustainable development. Supports the selective and combined use of chemical and organic fertilizers. He presents the problems but also advantages in tackling the problem of hunger and malnutrition, achieving social cohesion etc.
- **Ordinary citizens:** All other students in the group will be the audience of this debate. As consumers of the produced agricultural products, are suspicious for the chemicals found in the food chain but also for the higher cost and the "certification mechanisms" of organic products. Also they can submit via the Journalist-coordinator questions to the participants.

Remenber…..!

Participation in the role-playing game should not result in adoption by the students of the positions express through the role.