EGU2020-18081
https://doi.org/10.5194/egusphere-egu2020-18081
EGU General Assembly 2020

SCIENCHY - catchy science with IBSE approach

Valentina Brombin[1,2], Enrico Calore[3], Roberta D'Onofrio[1,2], Claudia Lauro[4], Chiara Marchina[1,2], and Beatrice Pelorosso[2]

[1]University of Ferrara, Physichs and Earth Sciences, Ferrara, Italy (brmvnt@unife.it)
[2]NOVA A.P.S., Ferrara, Italy
[3]INFN - Istituto Nazionale di Fisica Nucleare, Ferrara, Italy
[4]MUSE - Science Museum of Trento, Trento, Italy

The Sustainable Development Goal 4 of UN 2030 Agenda requires the implementation of education for sustainable development and sustainable lifestyle. In this context, Earth Sciences and related disciplines such as Environmental and Soil Sciences are fundamental teachings in any school to make younger generations aware about the effects of geological processes and human activities on climate change and to achieve possible solutions for sustainability. This aim clashes with the student difficulties in learning geosciences. In particular scientific terminology, abstract concepts, and depth of geological time make Earth Sciences difficult to understand and less attractive than others disciplines (King, 2012). As one of the hardest tasks for students is visualising unseen processes, Inquiry-Based Science Education (IBSE) is one of the best approaches to contrast this trend. This is an empirical learning method, based on “inquiry”, where students are encouraged to solve problems and explain phenomena, performing experiments. Despite in 1996 the USA National Science Education Standards defined IBSE as the best approach in natural science teaching, the majority of European classrooms are not implementing them (Rocard et al., 2007).

NOVA A.P.S. (Ferrara, Italy) promotes and disseminates STEAM (Science, Technology, Engineering, Arts, Mathematics) disciplines in secondary schools using the IBSE method. To evaluate the success of this approach, NOVA asked ninety 11-year-old students from an Italian school to perform a questionnaire about “Greenhouse gases: nature, potential sources, and effects on climate” after studying the theory with traditional frontal lessons. The questionnaire was proposed again to same group after the application of IBSE approach through its “5E” phases (Engage, Explore, Explain, Elaborate, Evaluate; Bybee, et al., 2006). Students were engaged to confirm the greenhouse theory exploring the phenomena in small different ecosystems built in cut-in-half plastic bottles, partially filled with 1) soil and 2) soil with plants, covered at the top with plastic wrap and exposed to sunlight. Another bottle with soil remained unwrapped to study also the potential effects in “absence of atmosphere”. For each bottle temperature changes and CO_2 emissions were monitored with sensors connected to Arduino boards. The comparison of these parameters in different ecosystems and conditions led students to explain the greenhouse effect and elaborate this concept revealing also i) difference between global warming phenomena and

greenhouse effect (a common misconception); ii) relevant role of soils on CO_2 emissions; iii) importance of vegetation in preventing the rising temperature. Finally, students were encouraged to self-evaluate the new acquired knowledge. The future task of this project is creating a sharing platform for teachers, where downloading instructions of the experiment and questionnaire form, and, in turn, uploading feedbacks. Testing and evaluating this method could bring teachers to combine traditional deductive lessons with more practical and stimulating approaches.

Bybee R.W., et al. (2006). The BSCS 5E Instructional Model: Origins, effectiveness and applications. Retrieved from http://www.bscs.org/bscs-5e-instructional-model

King H. (2012). Student difficulties in learning geoscience, Planet, 25, 40-47.

Rocard M., et al. (2007). Science Education NOW: A renewed Pedagogy for the Future of Europe, Luxembourg, Office for Official Publications of the European Communities.