CONNECT

Inclusive open schooling with engaging and future-oriented science

BEST PRACTICES

Description for the website:

Title: Investigation of potential sources of pollution on Lefkada by students of the 2nd Experimental Lyceum

This good practice reports an open schooling initiative about the Europen Connect program, which was developed by the 2nd Experimental Lyceum of Leukada and Biology teacher Dr. Dimitrios Ch. Lazaris during 30/11/2022 to 12/04/2023. The activities included a professional in science Forestry and Management of Environment and Natural Resources. It was supported by Dr. Georgios Panselinas Coordinator of the CONNECT Educational Informatics Project who provided information and guidance. This practice was presented at an event that organized the 2nd Experimental Lyceum of Lefkada and on the Connect platform (https://connect-eu.exus.co.uk/members/lazaris/documents/).

Care: Students were interested in and investigated the special characteristics of the island through the online collection of data on the natural & technical environment of Lefkada's island. The pollution of the natural environment, especially the coastal shores is a real-life problem where in many cases, the natural environment can be turned into an unjustified receiver of pollutants by local and tourist activities. This could negatively affect the island's natural environment in the future. The students who participated in the activities were twenty-one (21), male and female students of the A and B Grades of the 2nd Experimental Lyceum of Lefkada, aged 16-17.

Know: Students used knowledge about of Natural Sciences such as Biology, Chemistry, and Physics. Biology was used as a basis for understanding ecology and ecotoxicology. The skills that the students practiced were multiple such as:

- Investigative method (inquiry-based learning) with question definition, research design, research conduct, results, resulting in the strengthening of students' scientific thinking.
- Application of scientific methodology and utilization of environmental science elements.
- Cooperation with the scientific and local organizations of the island related to the environment.
- Collaboration with universities and research institutions for information exchange.
- Use of ICT (Information and Communication Technologies) to visualize the natural environment of Lefkada through the Google map and FILOTIS - Greek Nature Database, using the iNaturalistGR database.
- Investigation and presentation of the work plan (development of critical thinking, creativity, communication).

Do: At the end, the students prepared an electronic informational material which they posted on the school's website. This was after a metacognitive evaluation of the data on Lefkada's geophysical characteristics and the potential areas of pollution on the island. They also published an article in the school newspaper about the natural environment of the island. In the article, the students proposed ways to protect the environment, especially in the summer months when tourism increases. With the help of the Biology teacher in charge, the

students created a poster that refers to their actions in relation to the study of biodiversity and the study of potential pollution areas on the island of Lefkada. In addition, the students' work was presented at the annual event of the Excellence and Creativity Clubs and activities of the current school year 2023, at the 2nd Experimental Lyceum of Leukada. The President of the Governing Committee of the Model Experimental Schools, Mr. Tombras, the mayor of the city, teachers, representatives of local agencies, and students of the school were invited to the event. They completed the activities as a group and were supported by their family, and their classmates by sharing good practices and ideas. The parents were especially supportive of the students as they helped them search and record reports on the pollution phenomenon, twenty years ago on the island.

Findings related to Open Schooling approach: The activity was fitted and adapted to the curriculum as it combined chapters from Natural Science courses including Biology, Physics and Chemistry. The activity is an innovation in education because through it students can use scientific data and elements to solve problems in their daily life, such as issues of ecological balance and environmental pollution (decision-making ability). The purpose of this activity is the cultivation of citizenship, where students, as tomorrow's citizens and/or bioscientists, are called upon to make decisions about the environment, health, safety, and, in general, about any category of challenge that will arise from the applications of Biology/Ecology in our society. Open schooling might be both useful and challenging for teachers because it promotes students' active participation by creating learning environments that will be governed by the principles of modern teaching methodology, such as inquiry learning and experiential and communicative approaches, encouraging critical thinking and creativity.

Change/innovation supported by: [X] schoolhead [X] school association/network [X] local government
[ ] Other: _____

Students' Outcomes: The students initially showed a great interest in getting to know the natural and artificial environment of their island. In the Informatics laboratory, they watched a video showing the natural environment of Lefkada such as habitats, lagoons, and mountains combined with the human-made environment i.e. houses and tourist accommodations. The online Webex communication with the scinetist Dr.Vasilios Drosos, professor of the Department of Forestry and Environmental and Natural Resources Management of the Democritus University of Thrace, excited the students because they were given the opportunity to answer their key questions about pollution and the environment and to participate in a discussion as responsible and active members of an action. Students, as the most dynamic part of society, were receptive to learning during the seminar. This created a climate of mutual trust and interaction between the scientist and students. Furthermore, the students were excited about the use of google map, iNaturalist database and Filotis database for mapping and locating cities of Lefkada with a greater percentage of pollution with the use of software even though they were initially cautious. Some of the students mentioned "Is it possible that the software we find very easily on the internet can provide us with such a large amount of information?", "Can we also map the other islands in the Ionian Sea?".

This practice contributed to increasing:
[X] families' engagement in science [X] girls' participation in science. [X] students' science careers awareness

Please justify: The contribution of the students' families was decisive in the success of the activity. This is because they helped the students search and record reports on the phenomenon of pollution twenty years ago on the island and compare them with today's data. The participation rate of female students in the total number of students who participated in the activity was expected to be 52.4% (11/21). A large percentage of students expressed an interest in the following professions related to the Schools of Health Sciences (Medicine, Biosciences, Nursing) and Positive Sciences (Physics, Chemistry).

Please select the most relevant photo about your initiative (which will be public, and will be published with open license to represent the practice.

ABOUT THE CONNECT inst	
ORGANISATION	
COUNTRY	Greece
Partner' name (contact)	Giorgos Panselinas
Period of implementation	Initial date: 30/11/2022 Completion date: 12/04/2023
ABOUT THE TEACHER(S) INTERVIEWEES	
SCHOOL	2nd Experimental Lyceum of Lefkada
TEACHERS Names (for best practices certificates)	Dimitrios Lazaris
GENDER	Male
DISCIPLINE (Science, Physic, Chemistry, Biology, …)	Biology (Ecology, toxicology), Physics, Chemistry
How many lessons were used in open schooling?	No lessons were used, but some indirect ones were made references to them.
Title of the open schooling resource used	Investigation of potential sources of pollution on Lefkada by students of the 2nd Experimental Lyceum
Type of science-actions (structured or open scenario)	Open scenario
Curriculum topics	Biology, Chemistry
ABOUT THE TEACHERS' STUDENTS	
Grade	A & B
Average age	16,5
Total of students' participants	21
Total of students' who completed science actions	21

SCIENTISTS INVOLVED:	
Name	Vasileios Drosos
Field	Professor of the Department of Forestry and Management of Environment and Natural Resources of the Democritus University of Thrace

QUESTIONNAIRE

1. **How did you (teachers) use open schooling resources? Could you please describe what did you do in your lessons?**

Activities of Students with scientists:

The scientist's introductory lecture responded to the student's interests. This fact was not only achieved by the number of questions that took place during the seminar but also by the group discussions with the scientist, on the subject to be studied, and comparing the experiential experiences of the students involved (interconnection of the experiences). The lecture included a demonstration of images of various types of pollution, videos of the natural and artificial environment of Lefkada through drones and short-time documentaries about pollution and contamination of the environment.

Activities of Students with families:

Initially, parents were given informational material on the student's activity. The parents helped the students to look for and record historical data about the phenomenon of pollution twenty years ago on the island (e.g. if garbage was collected in all the towns and villages of Lefkada, where the garbage was buried, if there were enough bins of garbage) and compare them with today's data.

2. **How did your students used CONNECT resources? Do you have (or could describe) any samples of best science actions (for our website / reward)?**

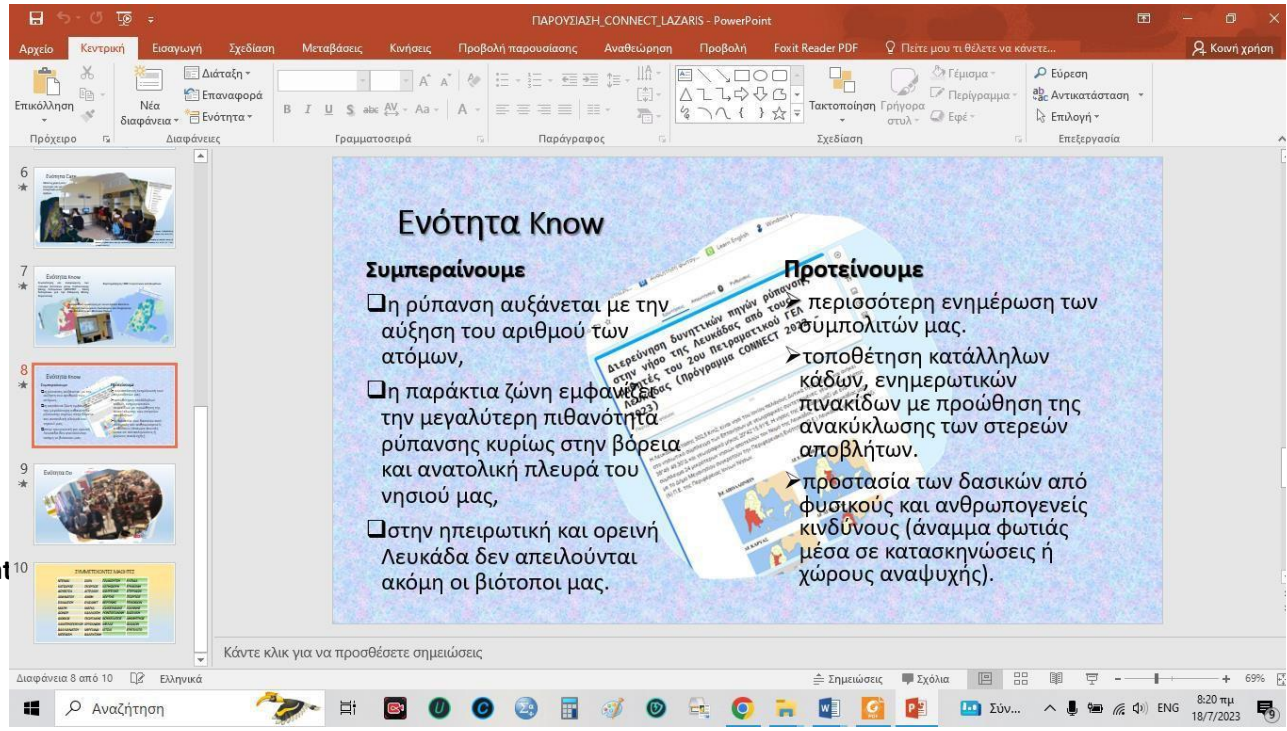
Any example of what students prepared?

The students started recording 1000 accommodations using Google Map (GPS satellite location signal) in the IT lab. These accommodations included hotels, studios, villas, and inns. Based on the records, most accommodations are located on the north, east and south side of the island. Those are the sides with the most tourism and the least in central mountainous Lefkada. The students then used the Filotis database in conjunction with iNaturalist to locate protected and non-protected habitats with most species and subspecies of flora and fauna on the island. In this way, it was investigated whether densely populated areas and tourism affect Lefkada's ecosystem biodiversity. In the end, all the data were used by the students to construct a map of Lefkada with the cities with the highest probability of pollution. The results were published in the school newspaper and at the student conference held through the Connect program.

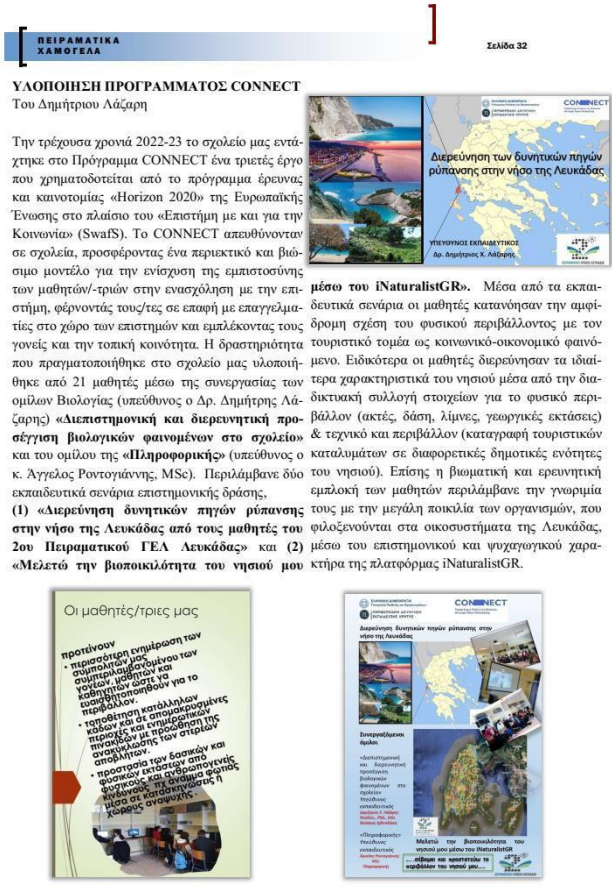
Slide? Poster? Video clip? (Add some images if it is possible)

Poster presenting the activities of students through the Connect program of the 2nd Experimental Lyceum of Lefkada.

A PowerPoint



Presentation



03. How well did science-action resources meet your needs?

Needs for example related to school curriculum:

The school's computer lab had the appropriate and necessary equipment for students to achieve their objectives. The computer and network equipment as well as the ergonomics of the space, the furniture and the machines ensured all the appropriate conditions for the students. The activity that took place at the school was implemented through the collaboration of the Biology group on the topic "Interdisciplinary and investigative approach to biological phenomena at school" and the "Computers" group.

The subject of the action was related to certain thematic sections of the school textbooks such as:

- Biology. B Grade. 2.1 The meaning of ecosystem/2.1.1 Characteristics of ecosystems/2.4 The human population/2.4.1 Man and environmental problems/2.4.2 Reduction of biodiversity.
- Chemistry B Grade. 2.8 Atmospheric pollution - Greenhouse effect - Ozone hole. You know that "A refrigerator without CFCs from Greenpeace".

Students' engagement:

The student's participation in the learning process was quite satisfactory. The group activities were designed to facilitate students' cognitive interactions and offer opportunities for the exchange of ideas, for the defense and refutation of claims, and for the free expression of opinions. The teacher in charge adopted strategies and techniques, so that together with the students he takes stock of the knowledge already assimilated by them. This is to build updated information and new knowledge on top of it. Thus the students discover new fields of learning on their own and systematized those they already possess.

Students' interest and confidence in science:

The student's interest and confidence in science were strengthened through the activities and the use of appropriate software. This encouraged their disposition for discovery, experimental approach and active participation. These activities cultivated their curiosity and encouraged them to question and explore to create positive emotional connections with the field of biological, ecological and chemical sciences. The dominant element in this activity was that students could be challenged to solve real- world problems using scientific principles and critical thinking.

04. How easy or difficult were science-action resources to use?

Please add any specific issues related to materials, procedures, interactions or curriculum:

The student's activity for studying pollution in Lefkada was implemented within the Biology and Computer groups. The project took place from late November 2022 to mid-March 2023. The time required for the program was not affected at all by the curriculum constraints. The school fully financially supported the logistical structures of the project.

05. What were the benefits of open schooling for your students?

Describe the students' outcomes in their science-actions related to:

KNOWLEDGE	• Utilization and deepening of students' knowledge of the island's natural ecosystems, flora and fauna. • Informing the students about issues related to the various types of pollutants from tourist activities, and environmental management. This gave the students the impetus to reflect. • Informing students about issues related to the interaction of organisms in natural ecosystems, types of ecosystems, biodiversity and species extinction risks.
SKILLS	• Investigative method (inquiry-based learning) with question definition, research design, research conduct and results, resulting in students' scientific thinking strengthening. • Application of scientific methodology and utilization of environmental science elements. • Cooperation with the island's scientific and local environment organizations. • Collaboration with universities and research institutions for the purpose of sharing information. • Use of ICT to visualize the natural environment of Lefkada through the Google map and FILOTIS - Greek Nature Database, using the iNaturalistGR database. • Investigation and presentation of the work plan (development of critical thinking, creativity, communication).
ATTITUDE	• Active participation in environmental literacy. • Respect and protection of areas of particular ecological importance such as lagoons and wetlands that host migratory bird species. • Commitment to the restoration and protection of areas of particular ecological importance such as lagoons and wetlands. • Environmental awareness and sensitivity. • Positive attitude and interest in island environmental events.

06. What were the challenges of using science-actions for your students?

Select the main challenges faced by students with and example:

Difficult…

□ Long…

□ Boring…

□ Other (Please, specify): The use and experience of applications, programs and special platforms.

07. Which activities worked well with the curriculum?

What helped kids to meet the learning objectives:

The use of ICT helped the students visualize / model in two-dimensional the natural and human environment of the island. The inclusion of ICT was done organically, targeted and in the context of appropriately designed teaching strategies (brainstorming, project-based learning, problem-solving) to attract and excite students during the learning process. This fact was achieved both at the level of understanding and at the level of interaction between the participants, i.e. teacher and students.

08. Which activities did not work well with the curriculum?

Anything that could be done differently or avoided:

The students could approach the observation and understanding of the elements of the natural and cultural environment in Lefkada in an experiential way through excursions and visits (outdoor experiential activities).