

CONNECT

Inclusive open schooling
with engaging and
future-oriented science

GOOD PRACTICES

Description for the site:

Title: The "cycle" of plastic

(Restructuring, regeneration and improvement intervention in the local community road network: A research field study)

This good practice presents an open schooling initiative on "Plastics and Food", developed by the 4th High School of Serres and the chemistry teacher Bazouki Evaggelia, from 01/02/2022 to 20/05/2022.

The implementation of the educational scenario was organized in the e-class, where the instructions, worksheets, a shared document, a shared photo-video album and useful for research web links were posted.

Three scientists participated in the activities: from the Department of Materials Science and Technology of the University of Crete, from the Department of Chemistry of the Aristotle University of Thessaloniki and from the Hellenic Centre for Marine Research. A professional from the recycling sector also contributed. For the meetings with the experts we collaborated with another part of our school that was implementing a multimedia related scenario.

It was supported by the Regional Directorate of Primary and Secondary Education of Crete. This practice was previously presented on the CONNECT platform.

Care: The students addressed a real problem, which is the impact of plastics on the food they come into contact with and thus on our health, and their presence as microplastics in the food chain.

They were concerned about the amount of plastic they use at individual and family level in terms of food and recorded it in a shared document. The labelling of plastics was another interesting element to investigate. They were interested in the fate of plastics after use, both in the disposal sites and in the recycling sites. Also, the possibility of replacing them with other less harmful materials.

The students who participated in the activities belonged to a class of 22 students in the second grade of high school, aged 16-17 years old.

Know: Students used chemistry knowledge about polymers, both artificial and natural. The technology of plastics is not taught in school and so students are not aware of the problems associated with their safe use. Thus, through the project, they investigated the safety of plastics in terms of their use in food packaging and storage (the material to be studied accompanying the scenario was posted on eclass).

They produced a bioplastic from a potato (following research) and investigated the role of the plasticiser. They filmed the experiment and entered it in an official competition of video experiments (PANECFE). They also tried to produce bioplastic from milk. They simulated a plastic recycling plant (sorting by type of plastic using special labelling). They proposed an experimental test to determine the type of an unlabelled plastic, following research.



They worked in groups to investigate microplastics (sources, shape, size, airborne dispersion) using an online activity and a prototype worksheet. They studied recent articles on the detection of microplastics in the human body.

To resolve questions and obtain additional information they contacted research scientists via videoconferencing.

The skills the students practiced were:

1. searching, evaluating and using information from the internet
2. scientific methodology (hypothesis, experiment, conclusion) - design and implementation of an experiment
3. critical thinking
4. decision-making after discussion
5. cooperation with peers within the programme and other European school programmes (Erasmus+ , European Parliament Ambassador School Programme)
6. communication with scientists
7. synthesis of opinions and formulation of proposals
8. digital creation
9. the use of collaborative digital tools
10. linking academic knowledge to everyday life.

Do: In the end, the students prepared

1. a podcast on the European School Radio platform about the project (in cooperation with our school's Erasmus+ programme).
2. a proposal which they submitted to the Future of Europe Conference (Objective: Sustainable Development - Health and Well-being) and to the Ministry of Education and Religious Affairs' conference simulation platform (in cooperation with the European EPAS programme)
3. an information leaflet on the correct use and disposal of plastics, for distribution to families and schools
4. poster on the creation and impact of microplastics, to be displayed in schools
5. presentation for participation in the National Student Conference CONNECT 2022.

Note: all relevant documents and links are posted on the CONNECT platform

Completed the activities as a team and supported by the families, the school's management and the Teachers' Association

Conclusions on Open Schooling: The activity was integrated into the curriculum. The proposed scenario was enriched with additional activities following the students' interests and current events (see microplastics). It was extremely useful and innovative, combining research - communication with scientists - collaboration with European school projects - creation, highlighting a problem of everyday life that is not directly perceived and quite prominent (creation and presence of microplastics).

Open schooling can be useful for other teachers because it enables them to open up educational horizons. They do not remain attached to the textbook and curriculum but are able to explore topics of everyday interest developing scientific thinking in students.

The change/innovation was supported by: School management school association/network Local government Other: _____

Student results: The students were very pleased with the opportunity to meet scientists and get information from them. Their participation in every kind of creation (experiment, poster, podcast...) excited





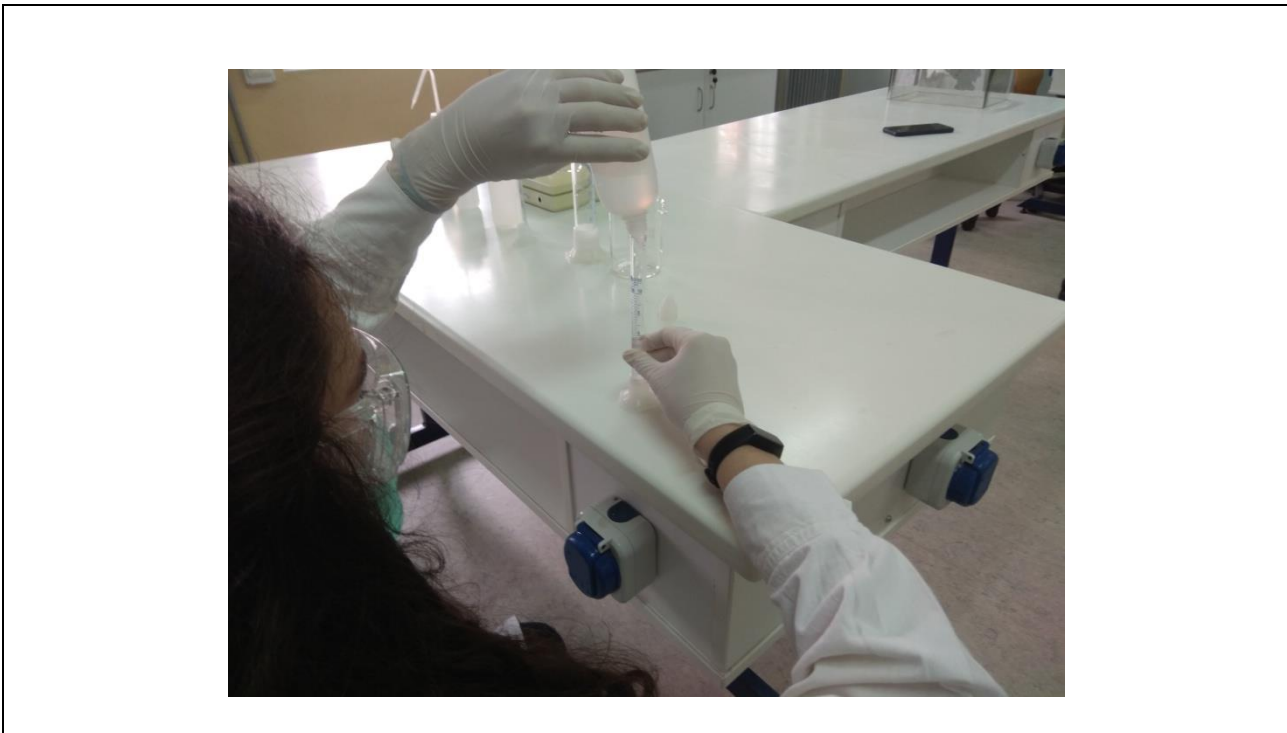
them. By the end of the project they were more confident in presenting and scientifically supporting their knowledge. As an example, a student with a low communication profile claimed his participation in the CONNECT Student Conference, worked diligently to prepare for it and represented our team deservedly.

This practice contributed to the increase of:

[x] engaging families with sciences [x] involving girls in science [x] raising awareness among students about careers in the natural sciences

Please specify: Families were actively involved in the first stage, helping to identify the link between plastics and food and the problem they pose. The children's mothers and their brothers and sisters were mainly involved. The girls made up the vast majority of the class and were very enthusiastic during the project. Of these, most will pursue Science Studies.

Select the most relevant photo related to your initiative (which will be public and published under an open license) to represent the practice.



ABOUT THE CONNECT PARTNER that supported the school

ORGANISATION	Regional Directorate of Primary and Secondary Education of Crete (RDE)
COUNTRY	Greece
Όνομα συνεργάτη	Georgios Panselinas, Charalampos Katsidis
Implementation period	Starting date: 01/02/2022 Ending date: 20/05/2022

ABOUT THE TEACHERS PARTICIPATED

SCHOOLS	4 th High School of Serres
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TEACHERS names (for Good Practices' Certificates)	Ms. Evaggelia Bazouki
Gender	Female
SUBJECT (Natural Sciences, Physics, Chemistry, Biology...)	Chemistry
How many subjects were used in open schooling?	4 during school hours, 4 extra hours and 3 for teleconferences
Title of open school education resource used	"Plastic and Food"
Type of learning scenario of science activities (structured or open scenario)	Structured Scenario
Curriculum modules	Chemistry 2 nd grade: Unsaturated hydrocarbons - Polymerization

ABOUT THE STUDENTS PARTICIPATED

Class	2 nd grade
Age (average)	16-17 years old
Number of students participated that concluded the educational scenario	22
Number of students who completed the educational scenario of scientific activities	22

SCIENTISTS PARTICIPATED:

Name	Vamvakaki Maria
Field	Materials Science and Technology / University of Crete
Name	Koulouri Giolanda
Field	Biology / EL.KE.TH.E.
Name	Achilias Dimitrios
Field	Chemistry / Aristotle University of Thessaloniki

QUESTIONNAIRE

01. How have you (teachers) used open educational resources? Could you describe what you did in your lessons?

Student activities with scientists:

We had teleconferences with the scientists in the "Know" phase. First with Mr. Achillia for general information about polymers and their applications. Then with Mrs. Vamvakaki where we focused on specific applications of polymers and unexpected problems (safety of biodegradation products). Finally, from Mrs. Koulouri we were informed about the impact of plastics on the aquatic world. During our meetings, the students watched presentations with interesting and unknown information and asked questions that were of interest to them. The meetings were interspersed in the "Know" phase, thus gradually covering the topic to be explored.

There was also a meeting with a local recycling professional to whom the students asked many questions about the plastics that their facility is required to manage.

Student activities with their families:

During the "Care" phase, students, together with their families, reflected on how much plastic is used in the food they consume or store. Over a period of one week, they collected all the plastic food packaging they used and recorded them on a shared document according to the type of plastic they were labeled with, while at the same time recording their use. The same document was later used to





record the safety and recyclability of plastics. The packaging was then brought to the school where the large number of packages was noted and sorted according to the type of plastic (simulation of a recycling plant).

02. How have your students used the CONNECT resources? Do you have (or could describe) samples of better scientific actions (for our site/rewards)?

Any examples of what the students prepared?

The students took material and ideas from the scientists' presentations and focused on the problem created by microplastics, both in aquatic organisms and in humans. Thus they prepared a poster to be displayed in the school in order to inform and raise awareness among their classmates and teachers. They also wanted to make bioplastic from milk and potato. The experiment of making the bioplastic from potato was filmed and sent to a competition of the PanNECFE.

In cooperation with the European EPAS project of our school, they submitted a proposal to the Future of Europe Conference (Objective: Sustainable Development - Health and Well-being) and to the simulation platform of the conference of the Ministry of Education and Religious Affairs. The proposal focused on the need to ensure citizens' health through proper information and scientific research on microplastics.

In cooperation with the Erasmus+ programme of our school they prepared a podcast for the European School Radio platform about the knowledge and experience gained from the CONNECT project.

Finally, they produced an information leaflet on the correct choice, use and disposal of food-related plastics. The culmination of the whole effort was the participation of the students in the CONNECT 2022 National Student Conference, for which they prepared a presentation of their activities.

Slide? Poster? Video?

(Add an image if possible)

Σήμανση πλαστικών

1 PETE 2 HDPE 3 V
4 LDPE 5 PP 6 PS 7 OTHER

1 Δε δηλώνει δυνατότητα ανακύκλωσης!!!

Πλαστικά & τρόφιμα

ο "κύκλος" του πλαστικού

ΠΛΑΣΤΙΚΑ & ΤΡΟΦΙΜΑ

- # συσκευασίες
- # δοχεία αποθήκευσης
- # μικροπλαστικά στην τροφική αλυσίδα

ΤΡΟΦΙΜΑ & ΑΝΘΡΩΠΟΣ

- # υπερκατανάλωση
- # υπερέκθεση στα πλαστικά μέσω των τροφίμων-επίδραση στην υγεία

ΓΗ & ΠΛΑΣΤΙΚΑ

- # πλαστικά που δεν αποικοδομούνται
- # μικροπλαστικά ρυπαίνουν αέρα, νερό

ΑΝΑΡΡΗΤΟΙ & ΓΥ

- # χρήση πολλών πλαστικών μιας χρήσης
- # η γη δέχεται τα πλαστικά απορρίμματα του ανθρώπου

ένα πλαστικό μπουκάλι νερού...

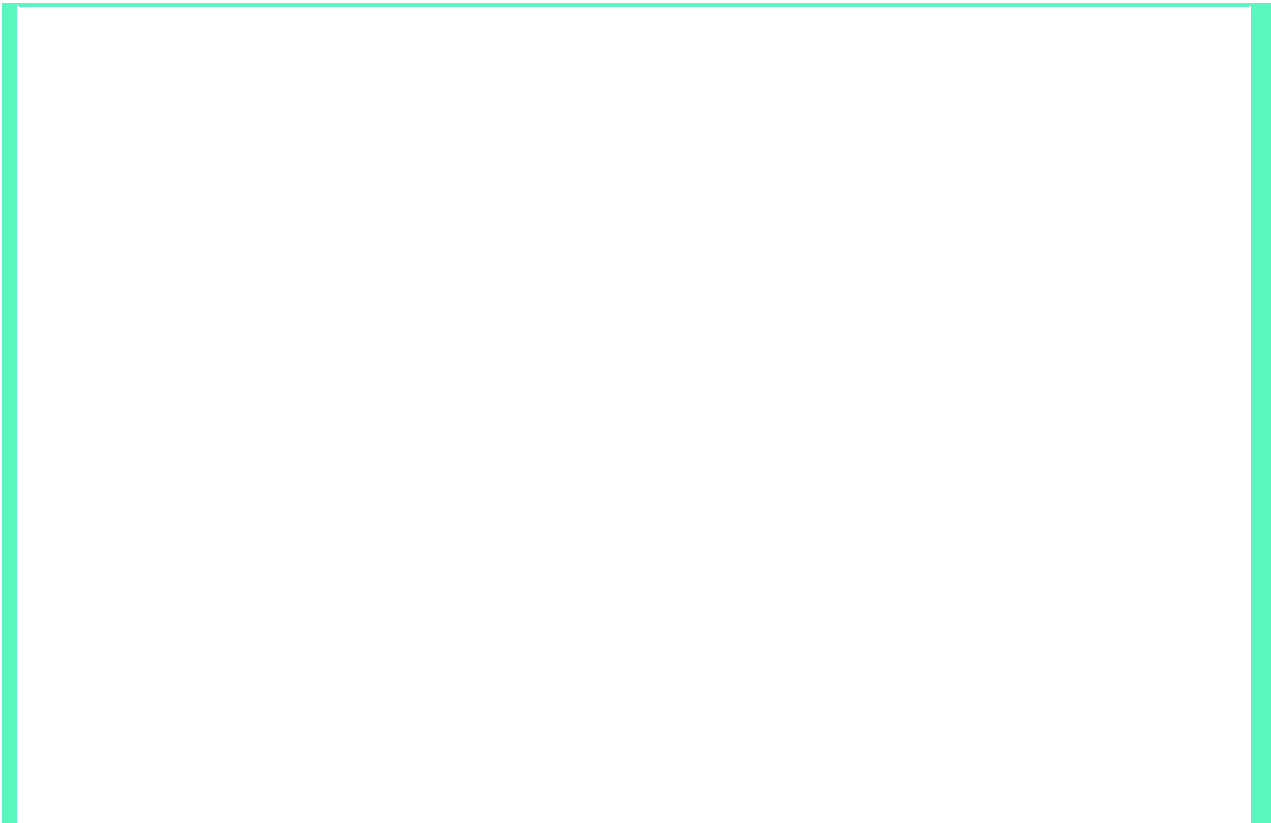
- με έκθεση στο φως του ήλιου και τη θερμότητα απελευθερώνει στο περιεχόμενο τοξικές ουσίες
- χρησιμοποιείται **μία ημέρα**
- παραμένει στη φύση **400-500 χρόνια** όπου...
- μετατρέπεται σε **φίλμ μικροπλαστικού**
- με μέγεθος **15 μm**
- που ταξιδεύει με τον άνεμο **332 km**
- καταλήγει στη **θάλασσα...**
- στα **ψάρια...**
- ...και στο **πίατο μας**
- καταναλώνουμε **ακούσια** έως και **5 γραμμάρια** μικροπλαστικών την εβδομάδα, όσο είναι το βάρος μιας πιστωτικής κάρτας!

Ο "κύκλος" σπάει με...

- # ανακύκλωση πλαστικών
- # χρήση βιοπλαστικών
- # κυκλική οικονομία

info@connect-science
www.connect-science.gr

https://www.wmf.gr/



03. How well did the science action learning scenario resources meet your needs?

Example related to the school curriculum:

The scenario got the students interested in polymers, the composition of which is taught in the second grade chemistry course (but not extensively). They learned directly from scientists about their modern applications.

Students involvement:

The students realised how widespread multimedia is in their everyday life and even in areas they never imagined. The relationship between plastics and food seemed somewhat frightening to them.

Student interest and confidence in science:

The meetings with the scientists were crucial. They saw how much research and in how many different areas is being done to improve our quality of life. They showed particular interest in the studies required to work in the areas highlighted by the scientists.

04. How easy or difficult it was to use the science action learning scenario resources?

Issues related to materials, procedures, pressure from the interaction with the curriculum:

In high school it is rather difficult to implement innovative learning methods. The schedule is suffocating, both in terms of curriculum and obligations. It took some students to allocate extra personal time to complete what they were assigned (video recording, poster, conference





presentation). But also at school the available time was quite limited by unforeseen factors. Some of our colleagues allocated time from their classes so that we could complete the activities.

05. What were the benefits of implementing the science action learning scenario for your students?

Describe the results of the students in their scientific actions related to:

KNOWLEDGE	The students gained knowledge about polymers in general and their relation to food in particular. These could not be acquired through the curriculum of the chemistry course or any other course. They also "got to know" the Department of Materials Science and Technology of the University of Crete, which was unknown to them, as well as the EL.KE.TH.E.
SKILLS	Students were trained to evaluate the information provided by the internet and to use it selectively. They developed critical thinking and the ability to synthesise opinions, formulate proposals and make decisions. Cooperation between students was a key parameter of the implementation and development of the scenario and there were initiatives for cooperation with other European projects of our school (Erasmus+, EPAS). By designing and implementing the experiment they learned and applied scientific methodology. They developed communication skills both with scientists and with a wider audience (see conference). Extensive use of digital collaborative and creative tools contributed to the development of relevant necessary skills for the students.
ATTITUDES	Students saw how science is connected to their everyday lives and how many areas are constantly evolving. New terms and new challenges were introduced. They started to take an interest in the plastics they encounter in different packaging (identification, recyclability) and to inform their families about the risks. Not to forget that such actions also change the image that students have of their teachers. CONNECT has brought us closer together.

06. What have been the challenges of using educational science activity scenarios for your students?

Main challenges faced by students (Please select all that apply):

- Difficult...
- Long duration...
- Boring...
- Other (Please specify): The limited time of the high school students required that all activities requiring research be done at school. But we also had limitations and unforeseen obstacles at school (schedule changes, special events, illness due to Covid, etc.). However, the students did not have much difficulty with the implementation of the activities.





07. What activities worked well with the curriculum?

What helped the children achieve the learning objectives:

The "Care" phase was catalytic because it created a warm atmosphere involving the families and helped to understand the magnitude of the problem. Each subsequent activity then "clicked" with the previous one and we were smoothly guided towards completion. Using the lab and doing the experiments showed the meaning of Science and meeting the scientists made a difference compared to other activities in other lessons. They were very happy when they showed the scientists the bioplastic they had made themselves.

08. What activities did not work well with the curriculum;

Anything that could be done differently or avoided:

It would have been better to start the implementation of the scenario earlier and spread the activities over time. However, it was a special year as it was preceded by the distance learning and required several hours of revision of the first grade material. This delayed the teaching of polymerization and dragged along the CONNECT project.

09. The school Principal's opinion about CONNECT:

Our school was very actively involved in CONNECT activities, linking with other European Projects. The open schooling provided students with opportunities to develop critical thinking and increased interest in Science. Through CONNECT the school took an additional step in preparing the citizens of tomorrow.

10. Parents' opinion about CONNECT:

"The CONNECT project pushed us, at home, to take action to protect the environment by making changes in our daily lives."

"My daughter's participation in the CONNECT project has increased her confidence in identifying, analysing and addressing problems in everyday life. It also helped the rest of the family to change their perspective around this issue."

