5 th SCIENTIFIC-EXPERT CONFERENCE

Zadar, September 26th to 29th, 2024

University of Zadar
Universitas Studiorum
Jadertina | 1396 | 2002 |

AQUARIUMPULA

Morski obrazovni centar Pula

Institut Ruđer Bošković

Climate Change and Preservation of Marine Ecosystems of the Adriatic Sea

Interdisciplinary approach to considering adaptations, measures, and good practices in resolving issues caused by climate change

Zadar, September 26th to 29th, 2024

https://conference.unizd.hr/jadran-klimatske-promjene

University of Zadar
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AQUARIUMPULA

Morski obrazovni centar Pula

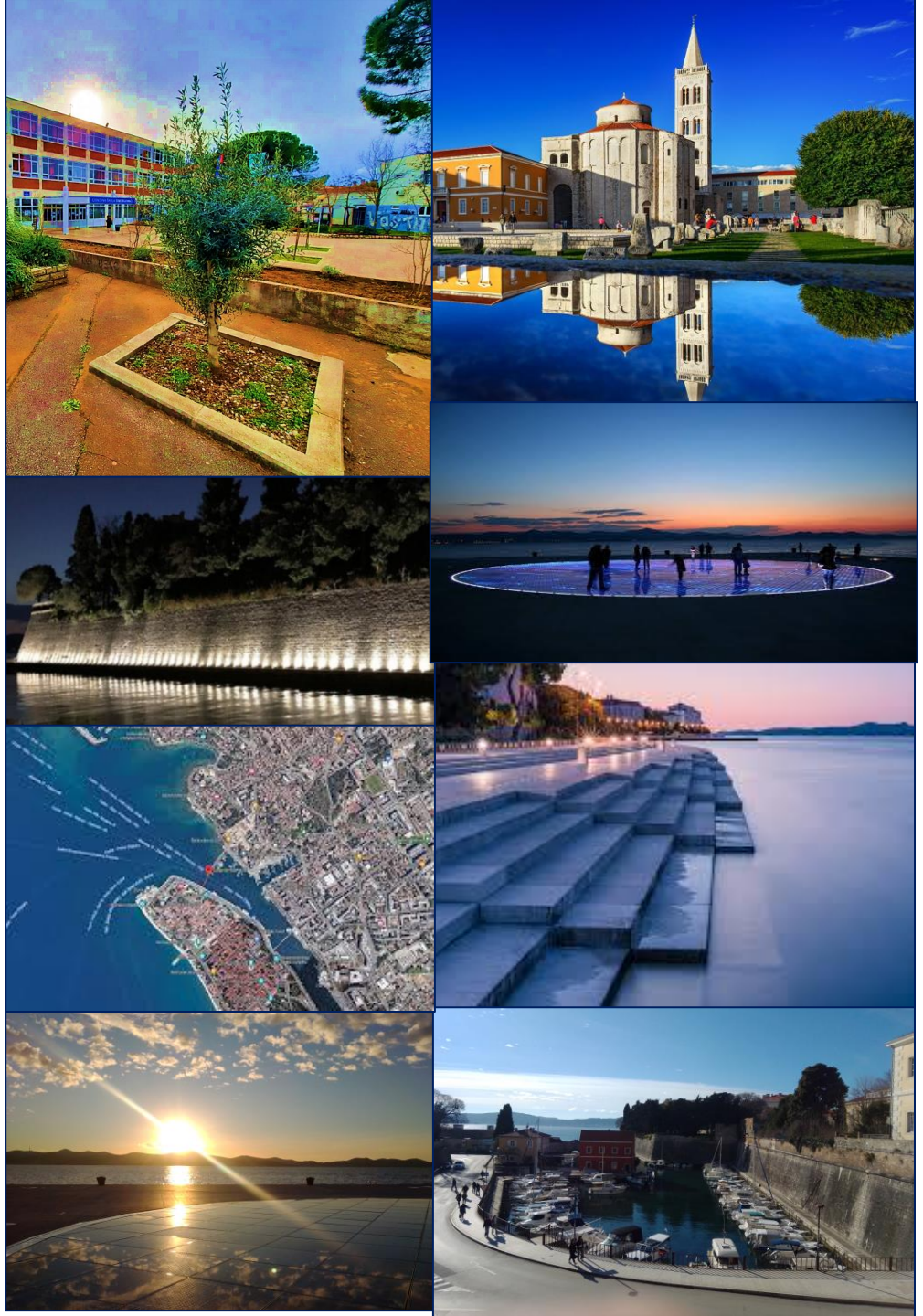
Institut Ruđer Bošković

Climate change impact on marine ecosystems in school curricula

Primary School Students' Research on the Impact of Climate Change and Sea Acidification on Marine Organisms

Elementary School Šime Budinić Zadar Crotia

Anita Mustać,
Master of Science in Biology,
excellent advisor



South – Eastern
Mediterranean Environmental
P r o j e c t

Biology
Ecology
Health
Biodiversity
Geography
History
Culture

SEMEP

(*South - Eastern Mediterranean Environmental Project)*

Interdisciplinary project of upbringing and education for sustainable development on the southeastern coast of the Mediterranean Sea

Catalog of professional meetings AZOO

South – Eastern Mediterranean Environmental Project

97.	4.7.2022. 5.7.2022. 6.7.2022. 7.7.2022. 8.7.2022.	Interdisciplinarni skup	Klimatske promjene u našem okruženju	državni	koordinatori i učenici SEMEP škola	Pridonijeti razumijevanju ideje odgoja i obrazovanja za održivi razvoj te promišljanju o učinkovitim načinima njegove provedbe istraživačkim pristupom temama. Primijeniti interdisciplinarni pristup u uključivanju škola u smanjenje ugljičnog otiska i tranziciji Hrvatske prema klimatskoj neutralnosti. Ugraditi elemente projekta SEMEP u različite nastavne predmete te odrediti mjesto SEMEP aktivnosti u školskom kurikulu.	Komiža	Marina Ništ
201	3. - 7. 7. 2023.	nterdisciplinarni	SEMEP	24. SEMEP Ljetna škola: Pridonosimo smanjenju klimatskih promjena u zavičaju	učenici i koordinatori projekta	upoznati primjere djelovanja znanstvenika u području zaštite morskog ekosustava u Jadranskom moru; pridonijeti razumijevanju ideje odgoja i obrazovanja za održivi razvoj te promišljanju o učinkovitim načinima njegove provedbe; upoznati primjere aktivnog djelovanje u školi i zajednici s ciljem prepoznavanja potreba; osmišljavati primjerena i inovativna rješenja djelovanja u školama u cilju smanjenja klimatskih promjena i tranziciji Hrvatske prema klimatskoj neutralnosti; ugraditi elemente projekta SEMEP u različite nastavne predmete te odrediti mjesto SEMEP aktivnosti u školskom kurikulu	Vis	Marina Ništ
83	8. - 12 . srpnja 2024.	državni	SEMEP	Klimatska otpornost - interdisciplinarno djelovanje 25. SEMEP ljetna škola	učenici i koordinatori projekta	Prepoznati nužnost interdisciplinarnog djelovanja na stvaranju klimatske otpornosti. Pridonijeti razumijevanju ideje odgoja i obrazovanja za održivi razvoj te promišljanju o učinkovitim načinima njegove provedbe. Upoznati primjere aktivnog djelovana u školi i zajednici s ciljem prepoznavanja potreba, osmišljavanja primjerenih i inovativnih rješenja i konkretnoga doprinosa djelovanja u školama u cilju stvaranja klimatske otpornosti i tranzicije Hrvatske prema klimatskoj neutralnosti. Upoznati primjere djelovanja znanstvenika u području zaštite morskog ekosustava u Jadranskom moru. Ugraditi elemente projekta SEMEP u različite nastavne predmete te odrediti mjesto SEMEP aktivnosti u školskom kurikulu.	Vis	Marina Ništ

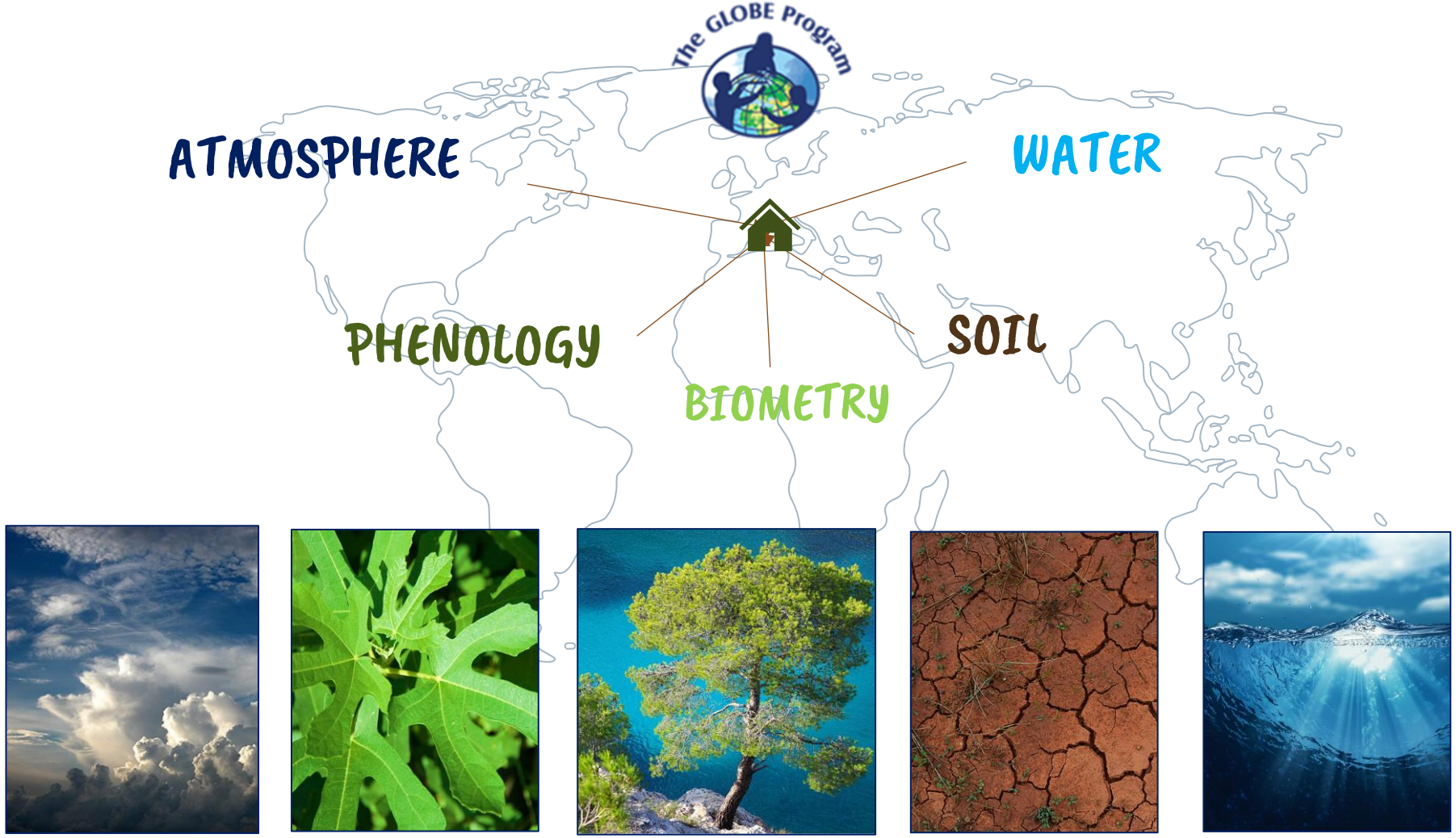
THE GLOBE PROGRAM

THE GLOBE PROGRAM

The Global Learning and Observations to the Benefit the Environment

GLOBE is an international program that deals with holistic learning and observation for the benefit of the environment.

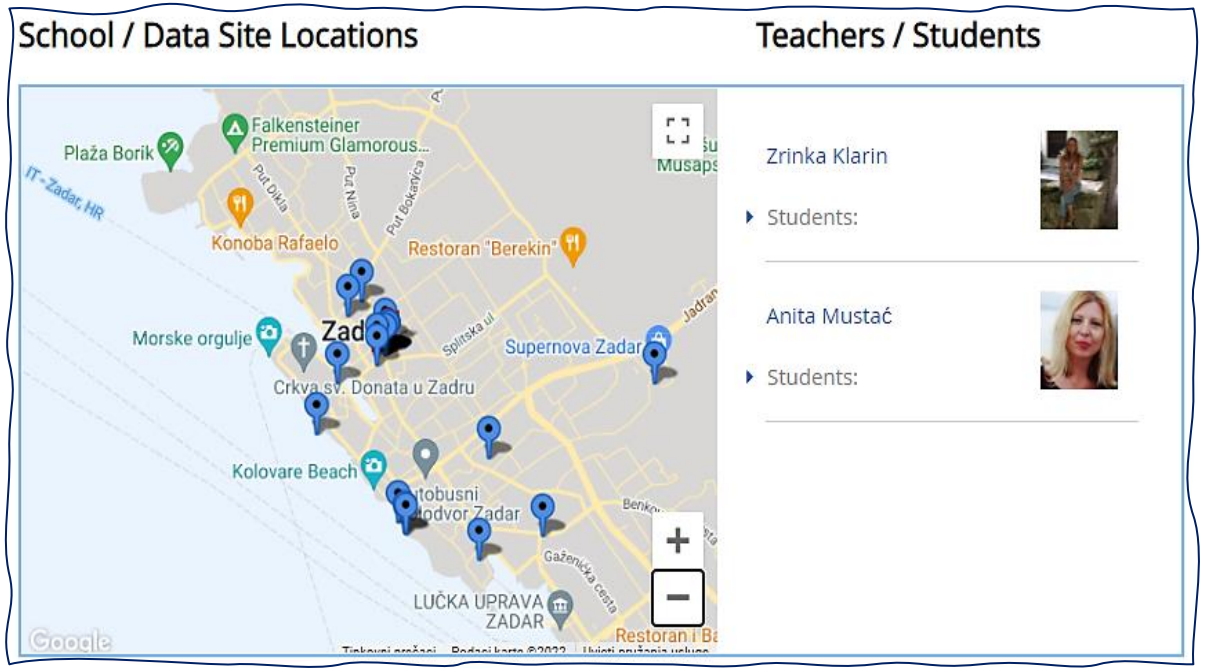
The GLOBE program includes regular and continuous student observations and measurements in the immediate environment for the areas of the atmosphere, hydrosphere, pedosphere and land cover.



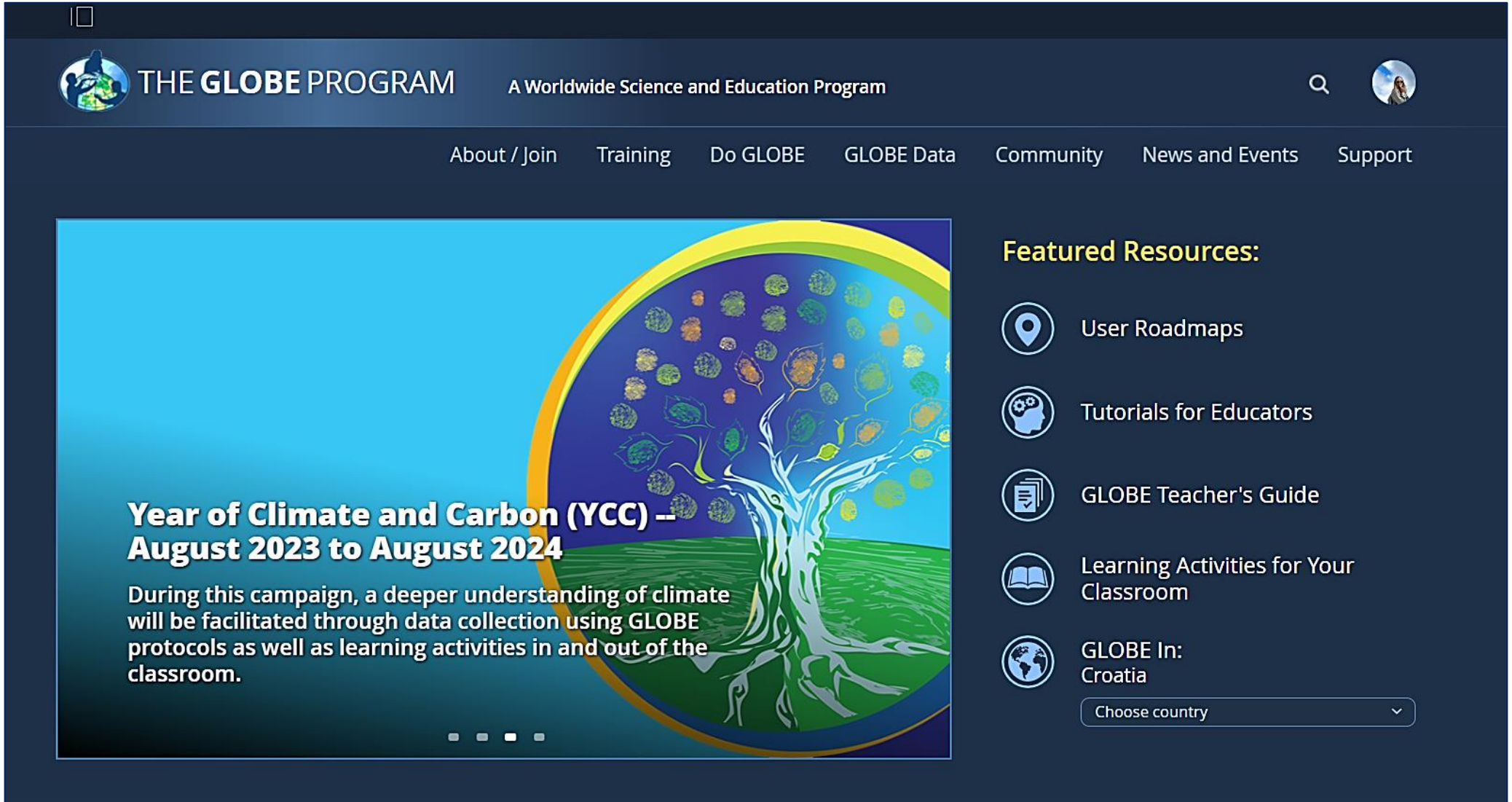
21 SITE

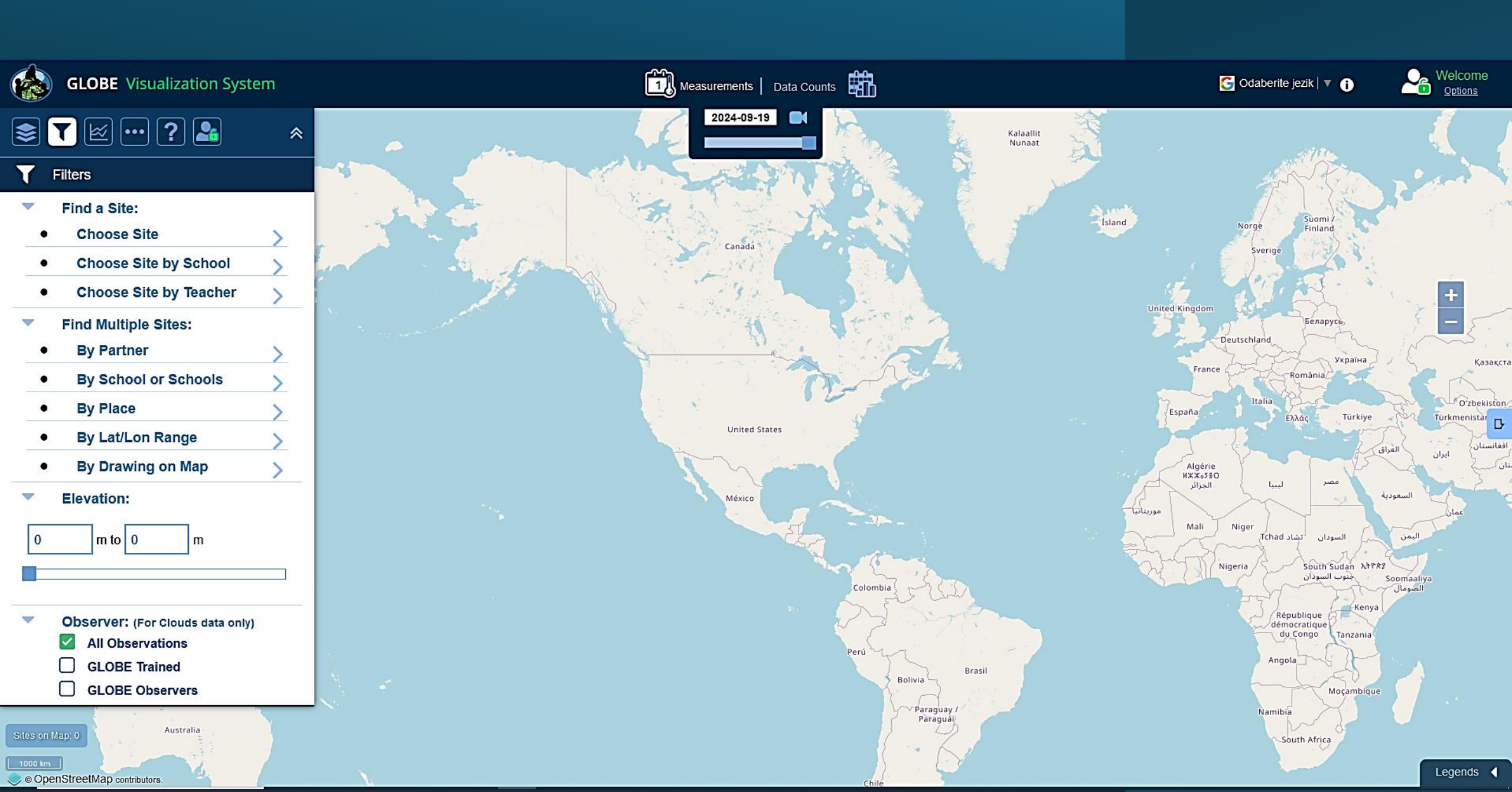
Elementary School Šime Budinić Zadar has been in the GLOBE program since 2011.

Students – 50
Globe teachers – 2
Site – 21
Data Entries – 870 000



https://www.globe.gov/




GLOBE Visualization System
Measurements | Data Counts
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Filters
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Choose Site
Choose Site by School
Choose Site by Teacher
Find Multiple Sites:
By Partner
By School or Schools
By Place
By Lat/Lon Range
By Drawing on Map
Elevation:
0 m to 0 m
Observer: (For Clouds data only)
All Observations
GLOBE Trained
GLOBE Observers
Sites on Map: 0
1000 km
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Legends
Kalaallit Nunaat
Ísland
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Colombia
Perú
Brasil
Bolivia
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افغانستان
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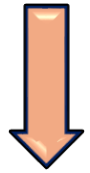
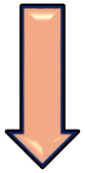
العراق
Algérie
الجزائر
ليبيا
مصر
السعودية
عمان
موريتانيا
Mali
Niger
Tchad تشاد
السودان
اليمن
Nigeria
South Sudan جنوب السودان
Soomaaliya الصومال
Kenya
République démocratique du Congo
Tanzania
Angola
Moçambique
Namibia
South Africa

CO_2 - a gas that occurs naturally in the Earth's atmosphere and in the oceans
- important for plant photosynthesis
- one of the main greenhouse gases that maintain the temperature on Earth

modern times



burning of fossil fuels, destruction of forests



increased concentration of CO_2

Source: https://pixbay.com

Source: https://pixbay.com

excess CO_2 in the air → excess dissolved CO_2 in the sea

Source: https://www.istockphoto.com/photo/recent-scientific-research-shows-that-1-3-of-anthropogenic-co2-carbon-dioxide-gm1344945669-423155229?searchscope=image%2Cfilm

↓

reaction with water

↓

formation of carbonic acid

↓

lowering the pH of the sea

↓

sea acidification

Research question: How does sea acidification affect marine organisms?

Hypothesis: Acidification of the sea affects the change of structures in the structure of marine organisms.

Research plan: - analyze data collected over 10 years on sea temperature and pH values at selected stations
- compare the effect of liquids of different pH (water, sea and vinegar) on the shells of clams, snails, sea urchins, chalk, eggshells

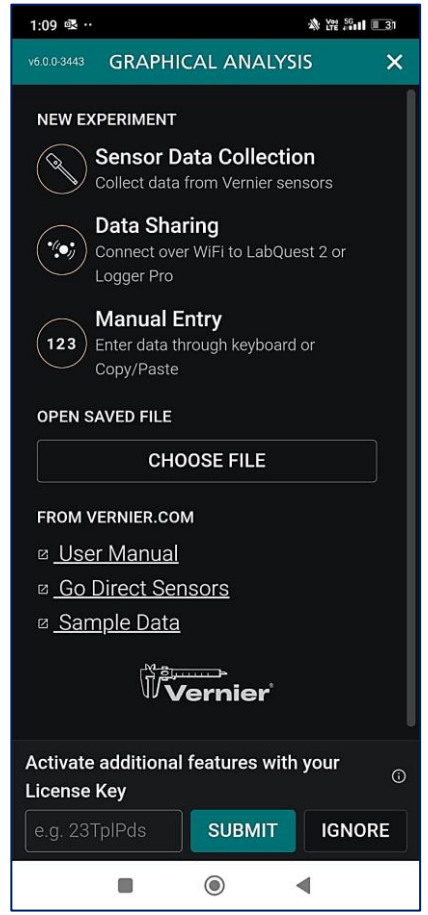
Presentation of results: creation and presentation of a presentation or poster

Making a conclusion

Materials and accessories: water, sea, vinegar, shells of snails, bivalves, urchins, chalk, eggshells, pH measuring instrument - Vernier Go Direct, Graphical Analysis application, GLOBE database, laboratory beakers, Petri dishes

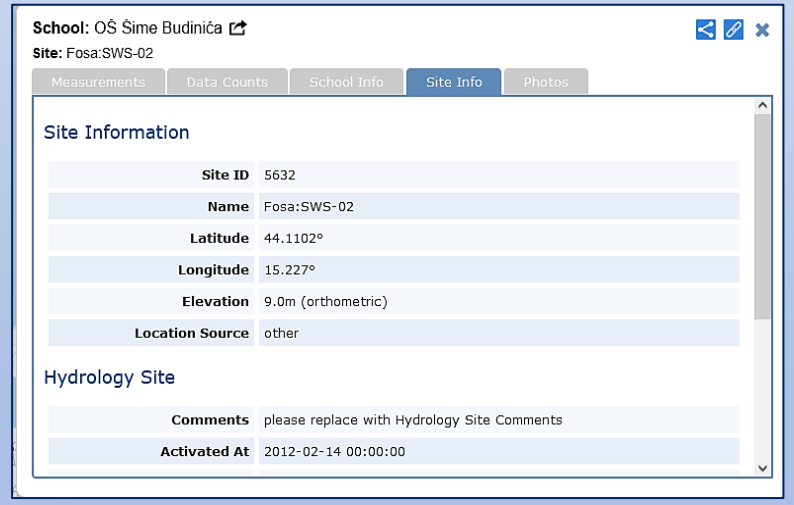
pH measuring instrument - Vernier Go Direct

Graphical Analysis application

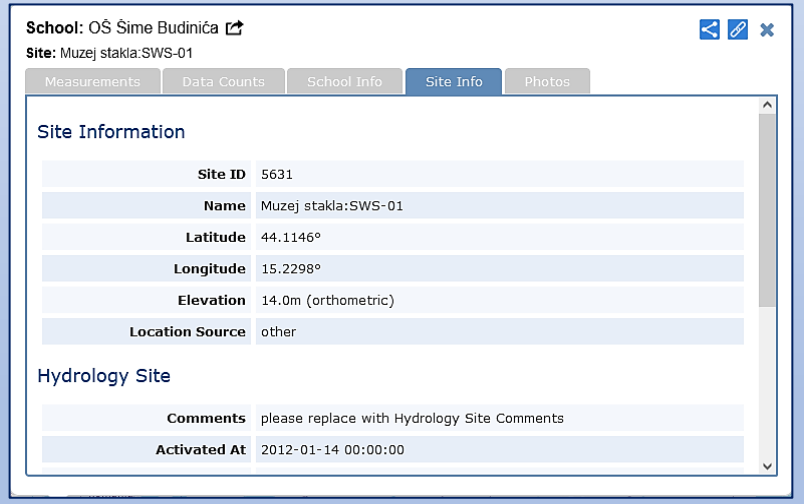


Measuring stations

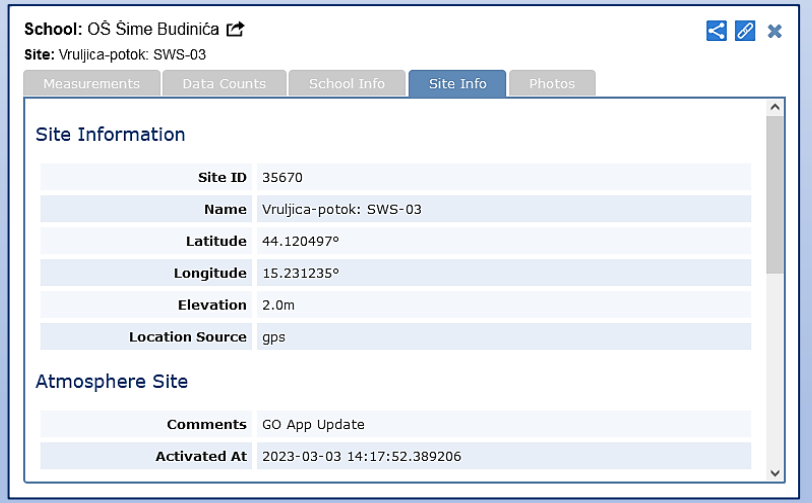
Protocols for the hydrosphere:
pH, temperature, salinity, dissolved oxygen, nitrates



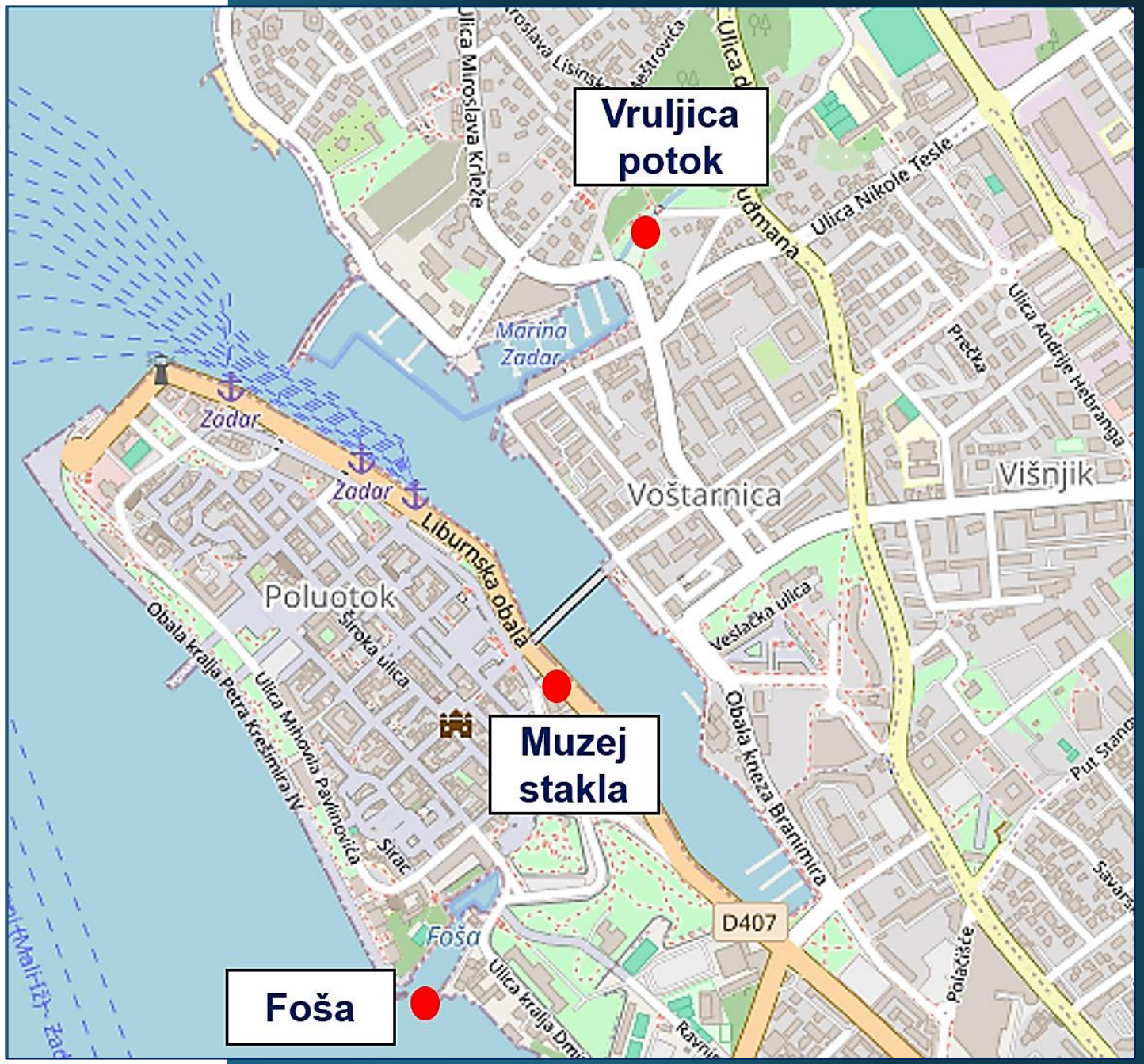
Foša



Muzej stakla

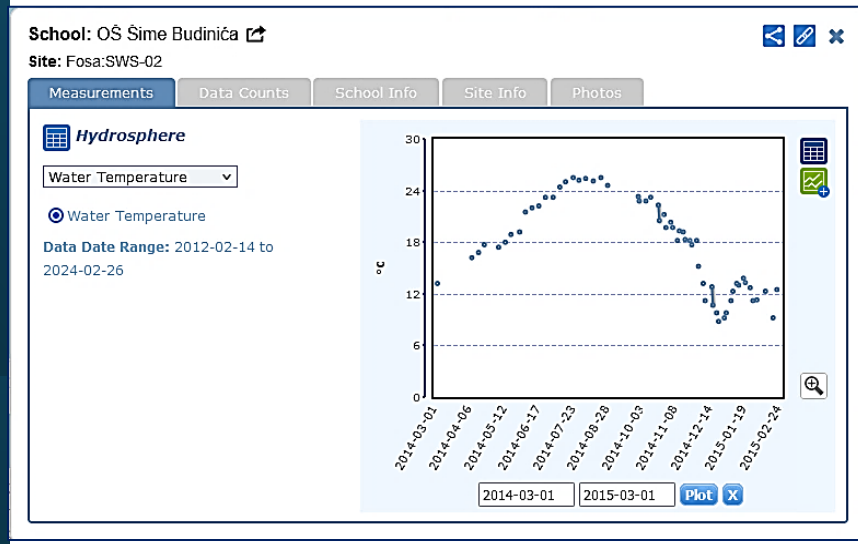


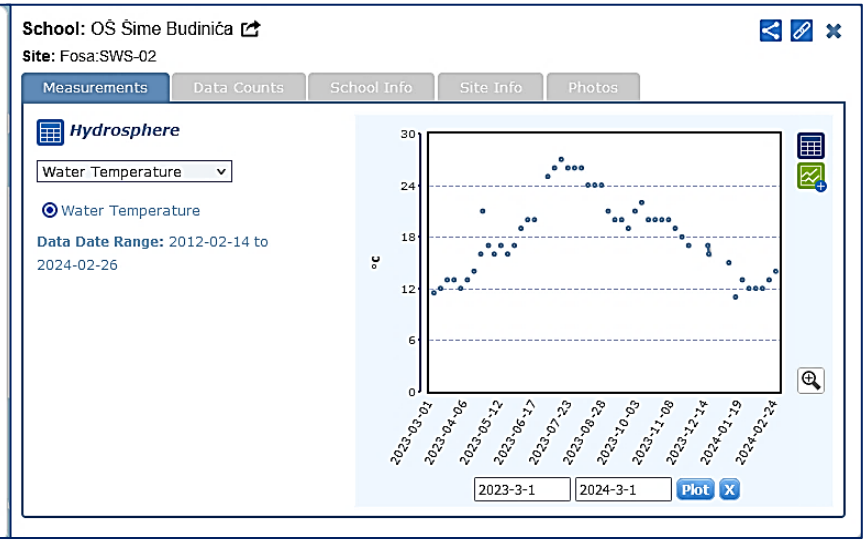
Vruljica potok

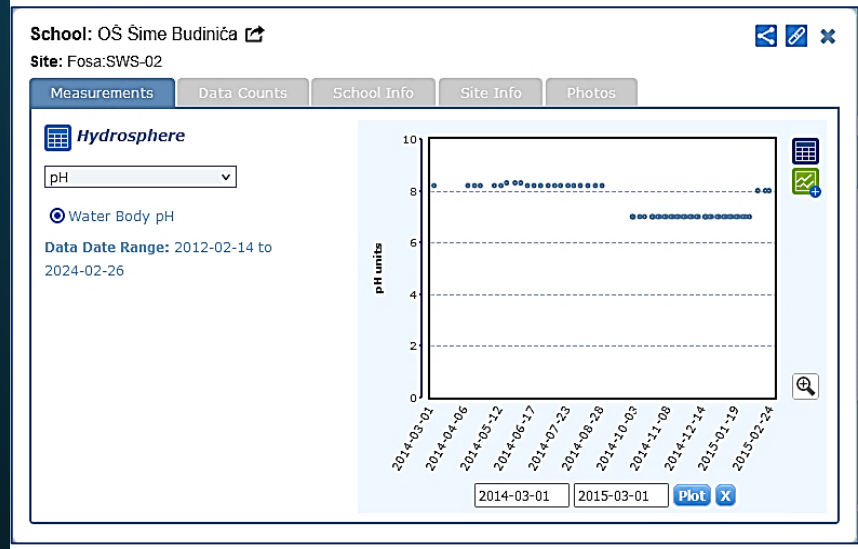

Vruljica potok
Muzej stakla
Foša
Marina Zadar
Zadar
Zadar
Zadar
Liburnska obala
Poluotok
Voštarnica
Višnjik
Ulica Miroslava Krleže
Ulica Nikole Tesle
Prečka
Ulica Andrije Hebranga
Veslačka ulica
Obala kneza Branimira
Obala kralja Petra Krešimira IV
Ulica Mihovila Pavlinovića
Široka ulica
Sirac
Foša
Ulica kralja Dmi
D407
Put Stanc
Savars
Polačišće

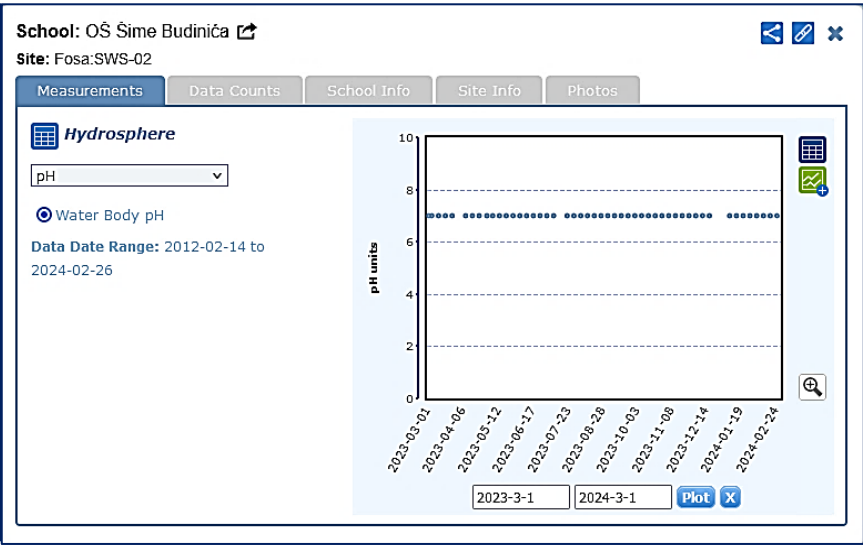
Foša –
Sea temperature measurement - 10 years ago and today

Foša –
Measurement of pH - 10 years ago and today



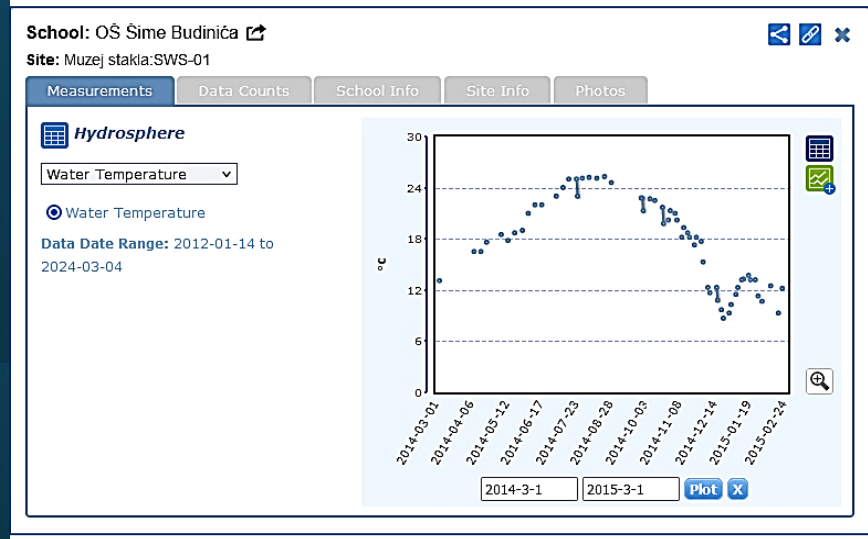


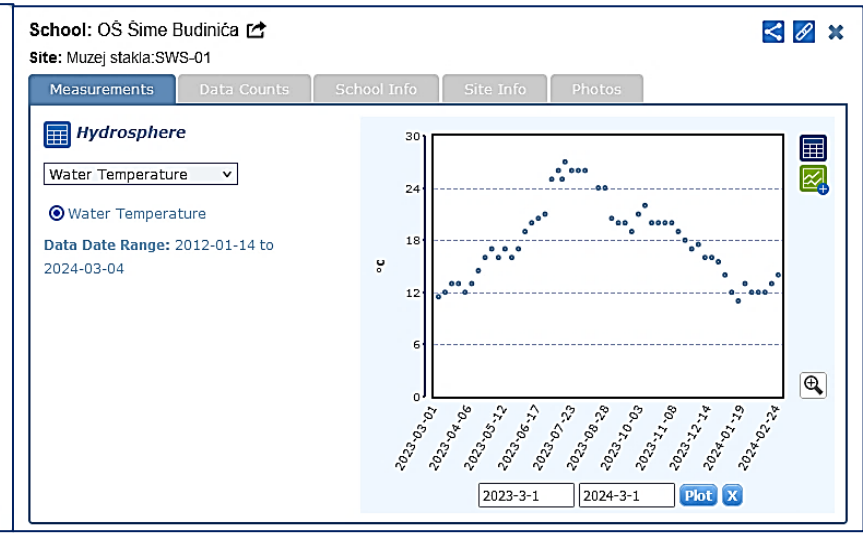


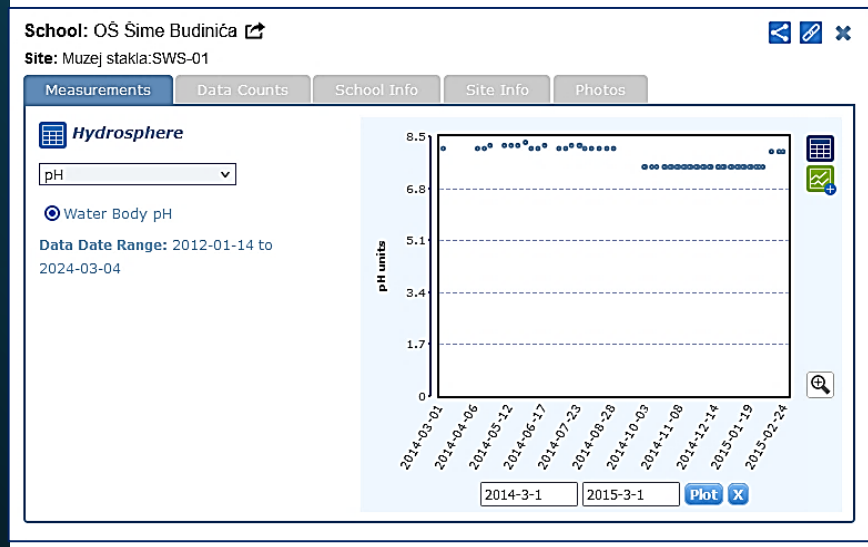


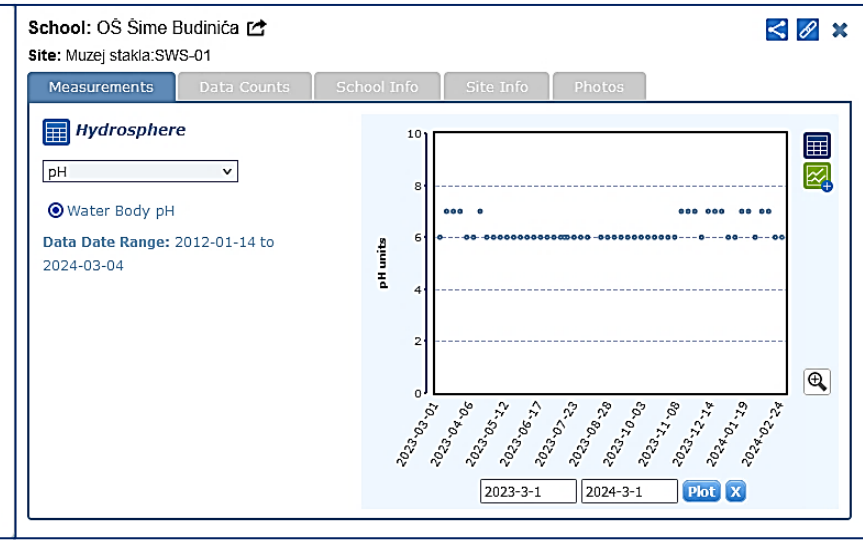
Muzej stakla - Sea temperature measurement - 10 years ago and today

Muzej stakla - Measurement of pH - 10 years ago and today



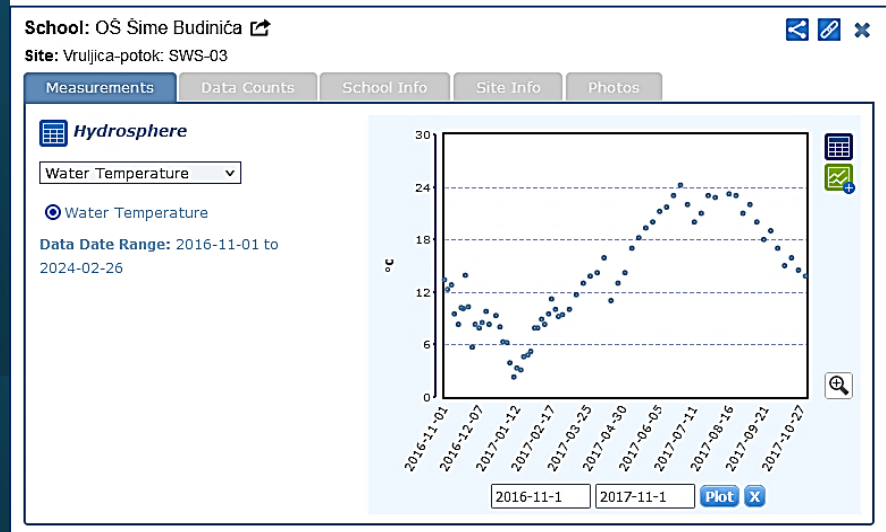


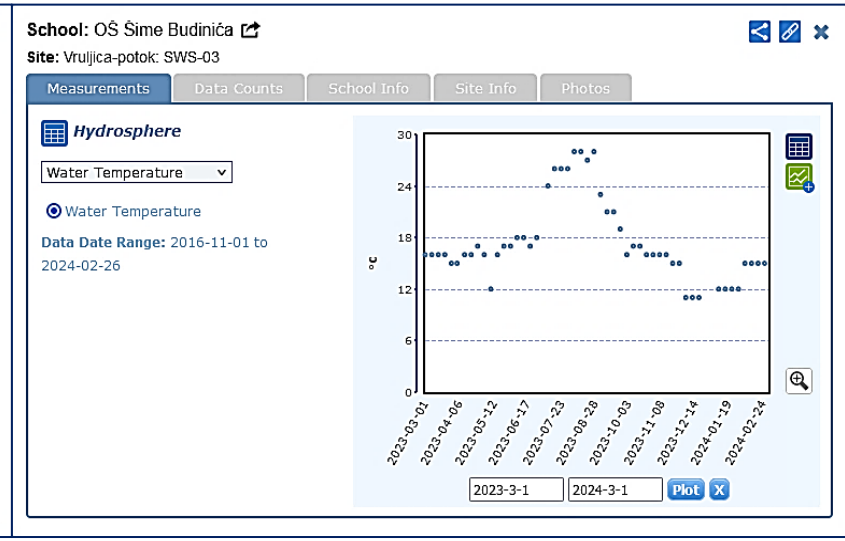


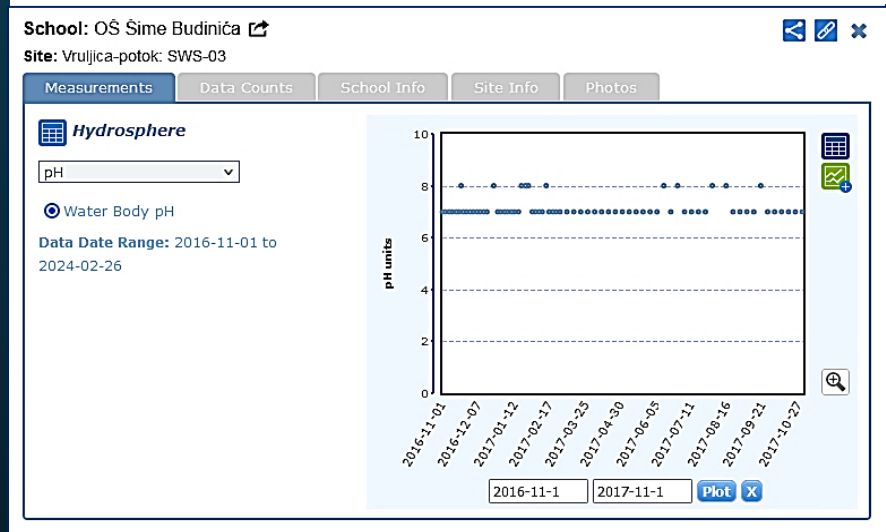


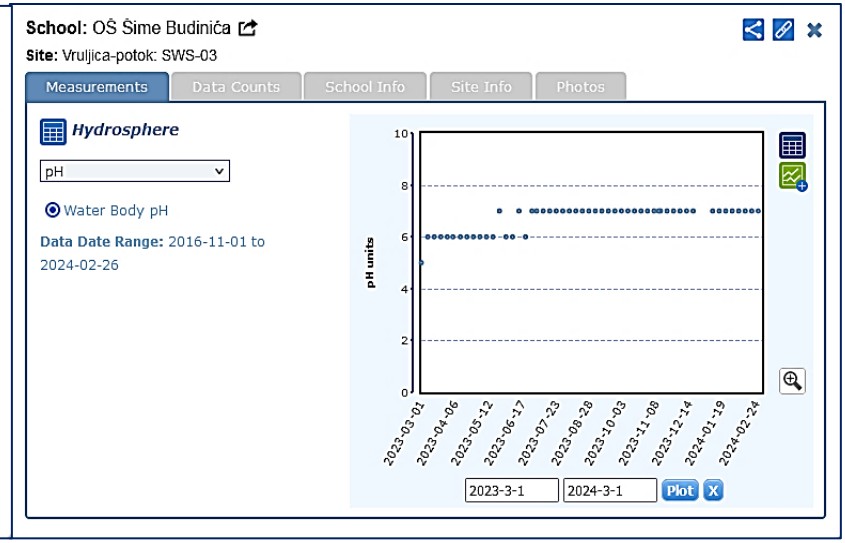
Vruljica potok - Sea temperature measurement - 10 years ago and today

Vruljica potok - Measurement of pH - 10 years ago and today



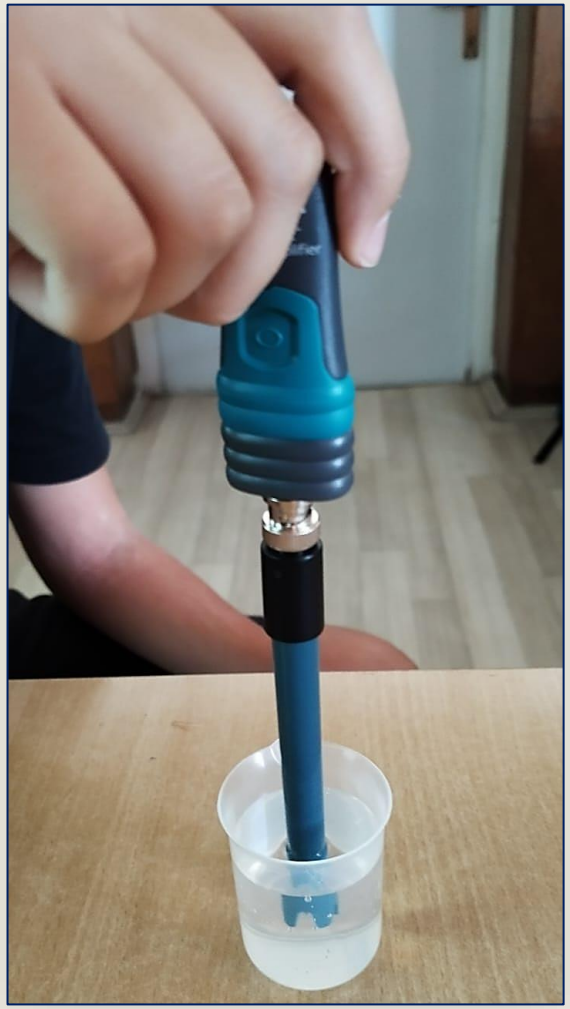


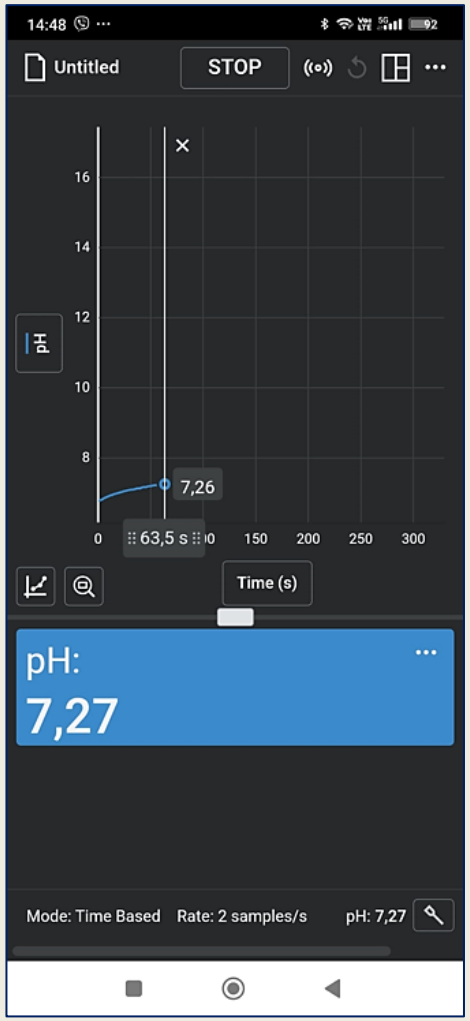




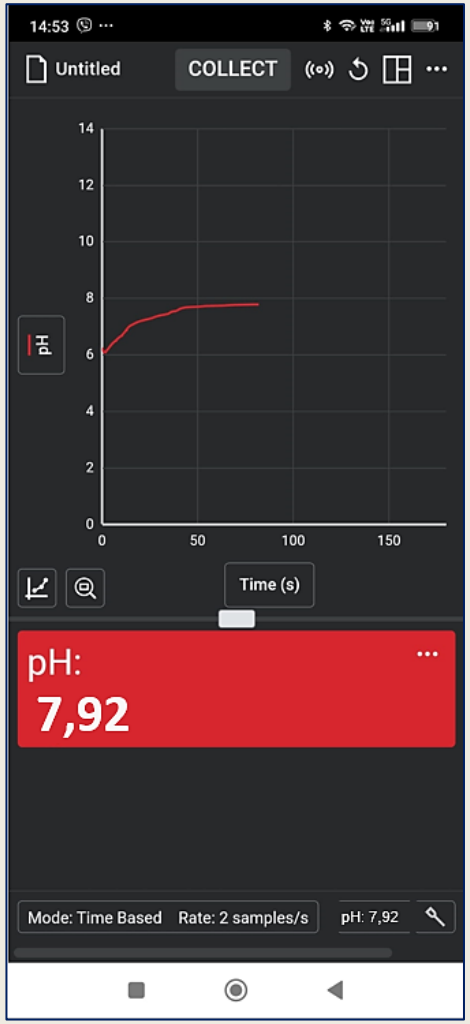
Experiment setup:

- pH measurement of liquids

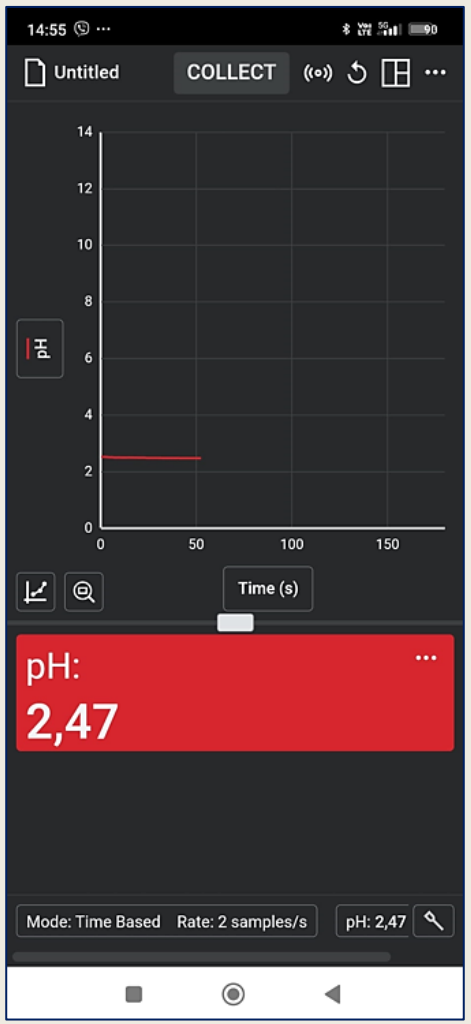




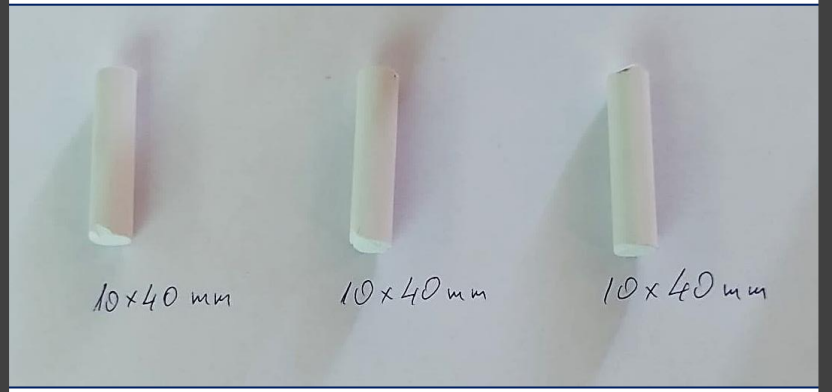
tap water



sea



vinegar



- shells of snails, bivalves, urchins, eggs, chalk


GO DIRECT PH


300
200
100
DURAN®
400 ml
Made in Germany
OCAT
MORSKA
VODA
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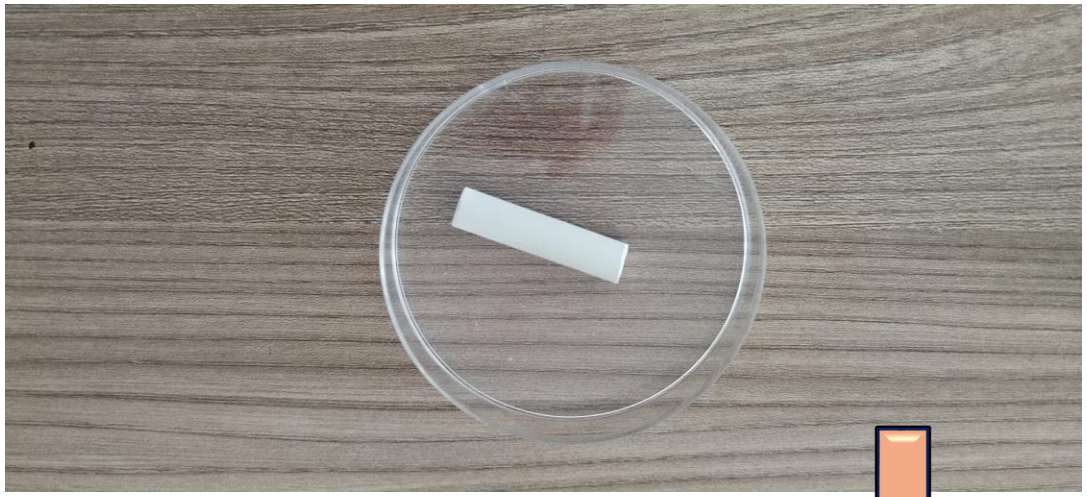
VODA

- monitoring the effects of vinegar on the shells of snails, bivalves, sea urchins, eggshells and chalk



reaction of vinegar and chalk

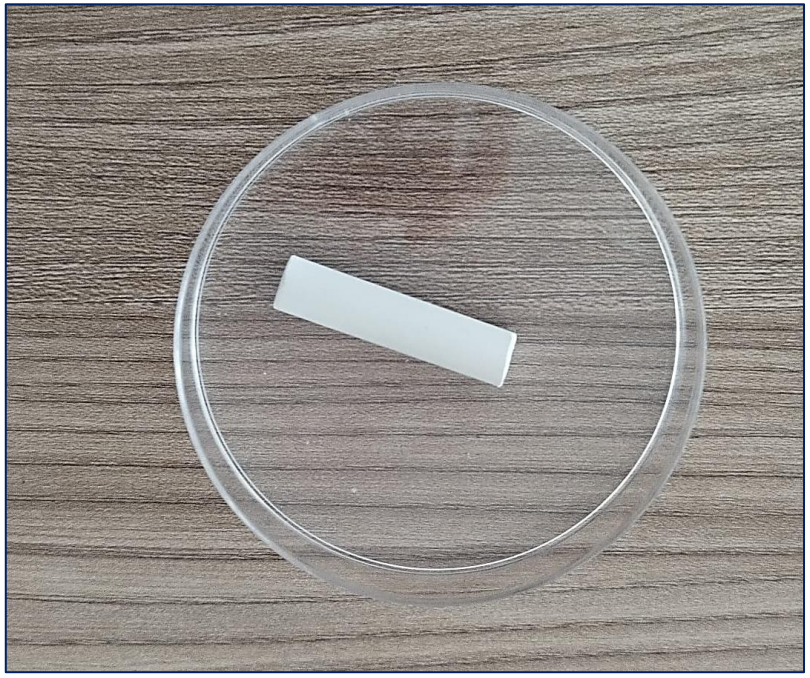
reaction of vinegar and sea urchin shell

reaction of vinegar and chalk

reaction of vinegar and sea urchin shell

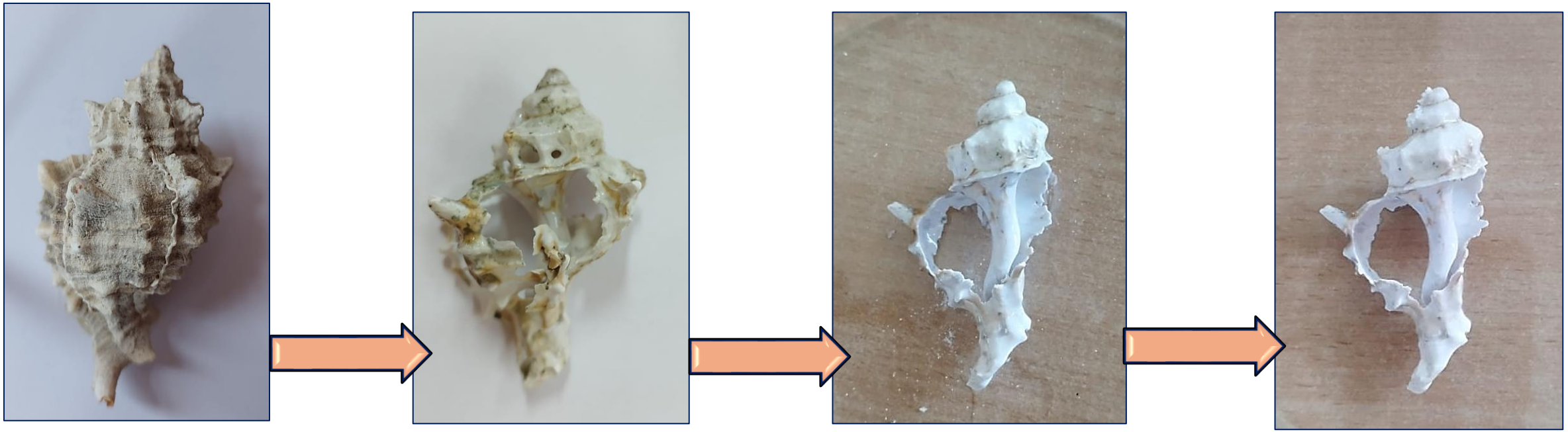
Changes after 6 hours

Changes after 12 hours

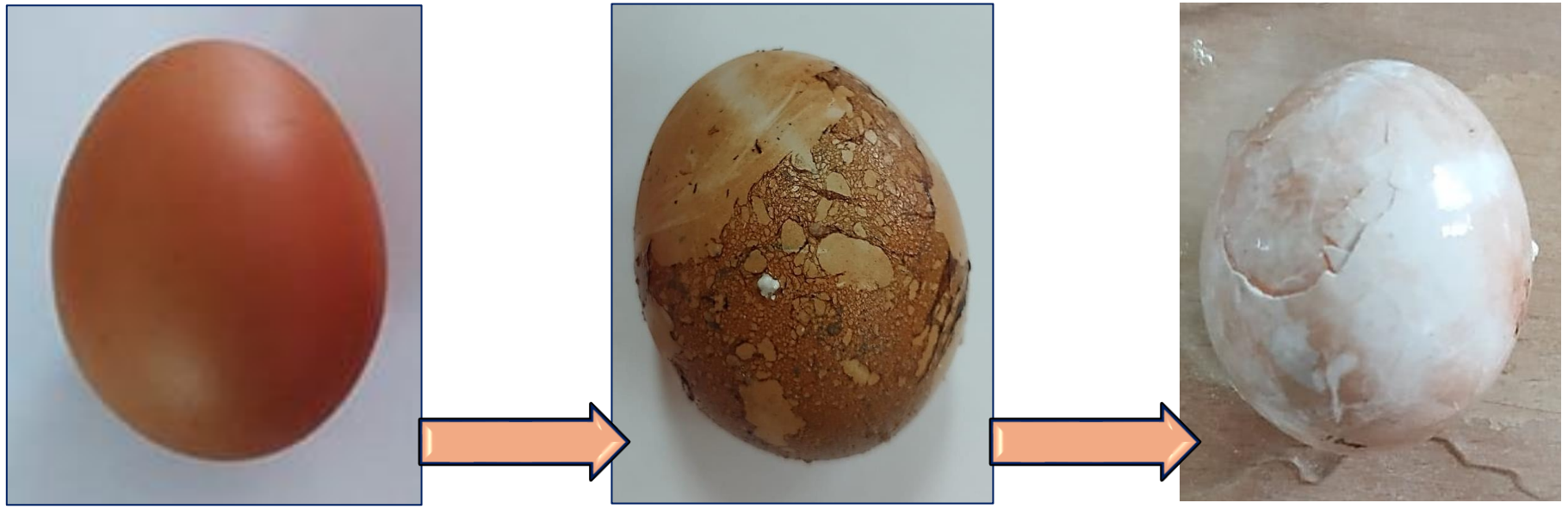


Changes after 6 hours

Changes after 12 hours



Changes after a week



Observations:

1. Vinegar causes changes in the shell of eggs, chalk, shells of bivalves, snails and urchins, while tap water and the sea do not cause changes in the course duration of the experiment.
2. Vinegar causes a violent and visible chemical reaction with chemical compounds in chalk and urchin shells.
3. In a chemical reaction, gas is released (air bubbles are proof).
4. Vinegar causes softening and cracking of the eggshell.
5. Vinegar causes chalk and urchin shells to dissolve after 24 hours.

Conclusion:

Sea acidification causes changes in egg shells, chalk, shells of bivalves, snails and sea urchins.

The student's proposal for continuing the research:

- measure the change in the size and thickness of the shells of the mentioned organisms during a longer period of research
- measure the amount of gas released in a chemical reaction

Thank you for your attention!

anita.mustac@skole.hr

Evaluation