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THE RIVER AS AN OPEN-AIR CLASSROOM FOR ENVIRONMENTAL EDUCATION: EXAMPLES FROM AN ITALIAN HIGH SCHOOL

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Background informations









- Jesi, Marche Region, Italy Liceo scientifico, applied science course
- Science education through laboratory
- IBSE → improve student's
 interest and performance and
 enhance teacher's motivation



Aim of the project



- To characterise the applied science course of the Liceo scientifico
- To strengthen science processes skills and experimental methods of investigation
- To aquire awareness on the role of the human community on earth
- To develop scientific citizenship
- PCTO (Pathway for trasversal skills and orientation)

The river



River is an ideal setting to investigate under many levels issues related with:

- Environmental health
- Pollution
- Climate changes
- Biodiversity
- Geology

Open air classroom to learn to be an aware citizen



Classes and istitutions involved



4° year

Geology

Potenza River

Università

di Camerino









\blacktriangleright Day 1 \rightarrow collection of the samples from the field

► Day 2 and 3 → laboratory analysis of the samples collected and data elaboration

Production of a report for evaluation and PCTO

Biological project



The invisible inhabitants of the soil and river

Collection and analysis of microarthropodes, macroinvertebrates and micro algae from the river environment

Can we drink the river's water ?

Water sampling and chemical analysis

\blacktriangleright Setting \rightarrow the Sentino River





The invisible inhabitants of the soil



Sampling







The invisible inhabitants of the soil



- Preparation of the samples
- Analysis of the samples







The invisible inhabitants of the soil







The invisible inhabitants of the soil

Analysis of the data, QBS calculation

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Mecotteri (larve)		10		
Coleotteri (larve)		10		
Ditteri (larve)		10	10	
Imenotteri (larve)		10	10	
Lepidotteri (larve)		10	JQ.	
Altri olometaboli	adulti	10		
		OBS	200	

Classi di qualità del

erimento per la QBS-ar

Caratteristiche	Classe	Valori	Tipologia
Gruppi euedafici assenti	0	Presenza di gruppi epigei	Suolo
	1	Presenza di gruppi emiedafici	Prato
Presenza di 1 o 2 gruppi euedafici	2	QBS ≤ 50	Erba
	3	QBS > 50	Campo d
Presenza di almeno 3 gruppi euedafici		Proturi a/a Calasttari secoti	Campo
	4	e QBS ≤ 100	Campo
	5	Proturi e/o Coleotteri assenti QBS > 100	
	6	Proturi e/o Coleotteri presenti QBS ≤ 200	
	7	Proturi e/o Coleotteri presenti OBS > 200	



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	90-180 60-180 60-100 50-60 30-40 \$€ \$\$\$











The invisible inhabitants of the river Sampling













The invisible inhabitants of the river

Analysis of the samples











The invisible inhabitant, microalgae analysis



Micro algae sampling was not possible in the river



The invisible inhabitant, microalgae analysis











Can we drink river's water?Sampling













Can we drink river water?

Water hardness analysis through complexometric titration









Can we drink river water?

Colorimetric assays using spectophotometry: nitrites nitrates and phosphates











Example of data obtained

Parametro	Valori ottenuti	Valori massini imposti dal limite di legge
Salinità	0,03 ppm	_
Temperatura	10,3°	-
Conducibilità	404 a 8° 553 a 25°	_
Residuo fisso	360,83 mg/l	Valore consigliato 1500 mg/l
рН	8,00	Tra i 6.5 e i 9.5
Durezza	5,9 °F	Consigliato tra i 15,0 e i 50.0 °F
Nitriti	0,644 mg/l	0,5 mg/l

Report of the biology project



Example of a report
Example of a report

Geological project





How much can water characteristic change along a river?

Measurement of water disharge

 Collection of water samples in the river and related springs

 Chemical analysis of most significant ions

Setting \rightarrow Potenza River

Geological project



- The main purpose was to show how water in a river undergoes significant changes.
- Rising water from the core of an anticline carries sulfates, and sulphides modifying downstream the river water chemistry.





Geological project Planned activities



► Day 1 → introductive seminary and geological fieldtrip

Day 2 \rightarrow collection of samples from the field

► Day 3 → laboratory analysis and draw of a geological profile

Production of a report for evaluation and PCTO

The effective actuation of the planned activities was not possible due to lockdown related to Covid.19.

Conclusions



GOOD ASPECTS

Active involvement of students in all phases of the project

CRITICAL ASPECTS

- Availability of university laboratories and staff
- Strenghtning processes related to science
- Focus on environmental issues through an active learning
- Development of awareness on different environmental issues

Characterization of the applied science course Time setting suitable for both school and university



Thank you for the attention







