PROCEEDINGS OF THE
9TH EUROGOOS
INTERNATIONAL CONFERENCE

3-5 May 2021

ADVANCES IN OPERATIONAL OCEANOGRAPHY:

EXPANDING EUROPE'S OCEAN OBSERVING AND FORECASTING CAPACITY

EuroGOOS
European Global Ocean Observing System

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HOW OCEAN LITERATE ARE STUDENTS ATTENDING SCHOOLS OF ARTS? A CASE STUDY FROM A GREEK MIDDLE SCHOOL

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Abstract

To achieve the Sustainable Development Goal (SDG) 14 focusing on the ocean, people need to understand the role and function of the ocean and be aware of issues concerning protection and sustainable use of its resources. The Ocean Literacy Framework is now being used worldwide for both formal (schools, universities) and non-formal (e.g. research institutes, aquaria) education settings. The present pilot study aims to this direction by evaluating ocean sciences content knowledge of students attending a middle school of Arts in Greece. A structured questionnaire was administered to 162 students, while the influence of certain demographics on students' knowledge level was also investigated. The results of the study revealed moderate knowledge, which is in line with the limited relevant literature regarding both knowledge gains and misconceptions, and the need for integration of relevant concepts in education to ensure sustainability of the ocean.

Keywords: Ocean Literacy, SDG 14, marine science education, Mediterranean region, secondary school students

1. Introduction

The Ocean Literacy Framework consisting of 7 essential principles and 45 fundamental concepts is now accepted worldwide for use in both formal (schools, universities) and non-formal (e.g. research institutes, aquaria) education settings to empower citizens to use knowledge of the ocean and awareness of its issues and therefore to communicate about the marine environment in a meaningful way and make informed and responsible decisions. The present pilot study aims to this direction by evaluating ocean sciences content knowledge of students attending a middle school of Arts in Greece.

2. Methodology

In total, 162 students comprised the sample of the study (36% grade 7, 35.4% grade 8, 28.6% grade 9). Females comprised 66% percent of the participants. The majority of students (85.7%) stated that they have participated in environmental education projects, while they receive relevant information mostly from the internet (88.3%). A structured questionnaire was designed according to previous research (see Mogias *et al.*, 2019), consisting of a demographics section, and a section including a content knowledge scale with 16 multiple choice questions, and a short beliefs scale with 4 statements. Data analysis involved descriptive (frequencies, mean values, and standard deviations) and inferential statistics (t-tests for independent samples and one-way analyses of variance)., All statistics were performed using the Statistical Package for Social Sciences (SPSS, v. 23); significance level was set at a probability value of 0.05.

3. Results & discussion

Middle school students were found to possess moderate level of ocean sciences content knowledge, as the mean relative frequency of correct answering among students was 45.9% (Table 1), and positive beliefs (mean value: 3.79) toward ocean stewardship (Table 2). Regarding background factors, no significant differences were revealed. The results showed an interesting pattern in correct answering, regarding the most difficult and the easiest questions, revealing that they are in line with other findings from the existing literature (Mogias *et al.*, 2019; Realdon *et al.*, 2019; Mokos *et al.*, 2020). Topics such as connectedness of the ocean basins (q1 and q8), origin of the atmospheric oxygen (q9), and global water cycle (q5) were failed to be addressed by the majority of the students' sample, revealing the existence of misconceptions, as well as either lack of assimilation of new or already existing concepts. Along with assessment of students' knowledge, attitudes and behaviour, European Blue Schools network has been recently launched and inter-disciplinary collaborations are enhanced through specific initiatives such as projects (e.g. ERASMUS+) and networks (e.g. EuroGOOS, EMSEA, EU4Ocean Coalition) in order to achieve the SDG 14 focusing on the ocean and create an ocean-literate society.

Table I. Number of students (n), relevant frequencies (rf) of correct answers per question, and alignment with the 7 essential principles (OLPs)

	CONTENT KNOWLEDGE QUESTIONS	N	RF	OLPs
q1	If I had a boat, I could theoretically travel in every part of the ocean	18	11.4	1
q2	If I walk in the mountains and sea a rock containing a fish fossil, it means that **the sea was once at a higher level than it is today**	18	11.4	2
q3	The first living organisms on earth lived **in the sea**	114	70.4	4
q4	The marine environment is home to **different animal species depending on sea depth**	85	52.8	4
q5	Most of the rainwater falling on land **originates from the tropical ocean**	32	20.1	3
q6	The Mediterranean Sea is home **to organisms of many different species**	113	71.1	5
q7	The least explored environment is **the deep sea**	72	45.3	7
q8	The Aegean Sea is connected to **all seas on the Earth**	36	22.5	1
q9	The main source of the oxygen that living beings breathe, **is the ocean**	20	12.7	4
q10	The largest animal on Earth **lives in the sea**	124	77.5	5
q11	The shape of the beach is mainly influenced **by the sea waves**	80	50.6	2
q12	The climate of my home town would experience **warmer summers and colder winters** if there were no sea nearby	65	41.1	3
q13	Most of the world goods are transported **by ships**	111	70.7	6
q14	Most of the water on earth is **in the ocean**	107	66.5	1
q15	The ocean resource which is most at risk of being exhausted **is fish**	83	52.2	6
q16	Scientists think that world climate change will cause **sea-level rise**	94	58.4	1

Table II. Mean values (± standard deviation) of beliefs per statement

	BELIEF STATEMENTS	MEAN	±SD
s1	The sea influences my life even if I live far away from it	3.92	1.04
s2	We need to study more the sea so we can protect it more successfully	4.09	1.01
s3	Whatever I through in the sink influences the sea	3.40	0.97
s4	The sea is a source of wealth and offers many jobs	3.76	1.03

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EUROGOOS
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The 9th EuroGOOS International Conference was the first virtual conference of EuroGOOS and was well received by the oceanographic and forecasting community. The participation of more than 530 people from over 40 countries around the world demonstrated the willingness of the ocean observing community to come together and showcase the latest achievements in operational oceanography, data management, and service delivery.

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