

Are Greek students ocean literate? Analyzing ocean science issues in primary education textbooks

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INTRODUCTION

It was the 1970s when a new field, which gave much attention to subjects regarding marine environments, first appeared inside the boundaries of Environmental Education (EE). The terminology used to describe this education innovation, was not poor: “water education” [1], “aquatic education” [1,2], “marine education” [3,4,5], “marine and aquatic education” [6]. Picker [5] reported that some teachers refer to marine education as “marine literacy”; to our knowledge this is the first record of the term “literacy” in the marine education field, which was about to be used extensively in the dawn of the 21st century. After many years of quiescence in the marine education movement, it was in 1996, when the National Science Education Standards in the USA were published, and the ocean educators realized that the text contained almost no mention of ocean topics [7]; marine education had officially become marginalized. As a result, a new round of meetings started in early 2000 with the participation of several organizations. The deliverables of the activity mentioned briefly above were an agreement about a simple definition of ocean literacy, a development of a short list of essential principles supported by several fundamental concepts [8,9] and a detailed tool called “Ocean Literacy Scope and Sequence for grades K-12”, in which it is described what should be taught at various grade spans [7].

One key issue on ocean literacy is school curricula and whether these have an ocean literacy oriented perspective.

The present study attempts to portray whether these essential principles and the corresponding fundamental concepts of ocean literacy are included in textbooks of Greek primary education, and in what extent.

METHODOLOGY

The textual corpus analyzed in our study, consisted of textbooks used for the teaching of science issues in Greek primary education. Four textbooks were taken under consideration: “Studying the Environment” (grades 1-4), “Geography” and “Science” (grades 5-6), and the optional “Environmental Education Interdisciplinary Activities Guide” (hereafter referred as “Activities Guide”) implemented mainly in upper primary grades (Figure 1). All textbooks were analyzed by employing the content analysis method [10]. Our analysis applied an a priori coding, because the categories, which were the seven Ocean Literacy Principles (OLPs) and the forty four corresponding fundamental concepts, were established prior to the analysis. As far as the unit of analysis is concerned, the whole page [11], containing either phrases or depictions (drawings, photographs, charts and maps), was used.



Figure 1

RESULTS

Ocean science issues cover 162 out of the total 1,125 pages of all textbooks analyzed, corresponding to 15.1%. The percentage of these pages varies among textbooks and grades. “Geography” textbooks display the highest pages percentage (29.7%), while “Science” textbooks the lowest (6%) (Table 1).

	Number of pages		Number of citations	
	n	%	n	%
“Studying the Environment”				
Grade 1	146	100	16	10.9
Grade 2	134	100	13	9.7
Grade 3	141	100	17	12.1
Grade 4	139	100	8	5.8
“Science”				
Grade 5	103	100	2	1.9
Grade 6	119	100	12	10.1
“Geography”				
Grade 5	146	100	42	28.8
Grade 6	144	100	44	30.6
“EE Interdisciplinary Activities Guide”				
	53	100	8	15
Total:	1125	100	162	15.1

Table 1

LITERATURE

- [1]Rakow S.J. (1983/84). Journal of Environmental Education, 15: 12-16.
[2]Picker L., L. Millman & K. Aspinwall (1984). The Environmentalist, 4: 59-63.
[3]Fortner R.W. & T.G. Teates (1980). Journal of Environmental Education, 11: 11-19.
[4]Fortner R. & T.M. Wildman (1980). Science Education, 64: 717-723.
[5]Picker L. (1980). Science & Children, 18: 10-11.
[6]Goodwin & Schaadt (1978). Delaware Sea Grant College Program, University of Delaware, College of Marine Studies, Newark.
[7]Schoedinger S., L.U. Tran & L. Whitley (2010). NMEA Special Report, 3:3-7

- [8]Cava F., S. Schoedinger, C. Strang & P. Tuddenham (2005). A Report on Ocean Literacy
[9]Strang C. (2008). Current: The Journal of Marine Education, 24: 6-10.
[10]Krippendorff K. (1980). Sage Publications, Newbury Park, CA.
[11]Elo S. & H. Kyngäs (2007). Journal of Advanced Nursing, 62: 107-115.
[12]Tran L.U., D.L. Payne & L. Whitley (2010). NMEA Special Report, 3: 22-26.
[13]Stokes E., A. Edge & A. West (2001). Final Report, Environment Directorate-General of the European Commission.

The number and percentage of pages which contain texts and depictions, concerning ocean science issues, also varies among textbooks and grades (Table 2). “Studying the Environment” textbooks for grades 1-2 display the highest depiction percentage, while the “Activities Guide” the lowest. On the contrary, the text format appeared in the 100% of the citation pages in both “Science” and the “Activities Guide” textbooks (Table 2).

Table 2

Textbooks	Citation pages		Text		Depiction	
	n	%	n	%	n	%
“Studying the Environment”						
Grade 1	16	100	6	37.5	16	100
Grade 2	13	100	10	76.9	13	100
Grade 3	17	100	12	70.6	9	52.9
Grade 4	8	100	7	87.5	4	50
“Science”						
Grade 5	2	100	2	100	1	50
Grade 6	12	100	12	100	12	100
“Geography”						
Grade 5	42	100	39	92.9	27	64.3
Grade 6	44	100	42	95.5	34	77.3
“EE Interdisciplinary Activities Guide”						
	8	100	8	100	2	25
Total	162	100	138	85.2	118	72.8

Table 3

Textbooks	Principal #1	Principal #2	Principal #3	Principal #4	Principal #5	Principal #6	Principal #7
“Studying the Environment”							
Grade 1							
Grade 2							
Grade 3							
Grade 4							
“Science”							
Grade 5							
Grade 6							
“Geography”							
Grade 5							
Grade 6							
“EE Interdisciplinary Activities Guide”							

The study of all textbooks showed that not all seven principles, neither all fundamental concepts were cited per principle. OLPs 1, 5 and 6 are the most represented principles (Table 3). Five principles are represented in “Geography” – grade 5 and the “Activities Guide” textbooks, while only one in “Science” – grade 5. OLP 7 is not reported at any textbook (Table 3).

OLPs 1, 2, 4 and 6 have all or most of their fundamental concepts represented in Greek primary textbooks, followed by OLPs 3 and 5 (Figure 2); in particular, OLPs 1d, 2a,d, 3d,e,f,g, 5a,b,c,d,g,h and 6f are not represented in any textbook or grade (Table 4).

Figure 2

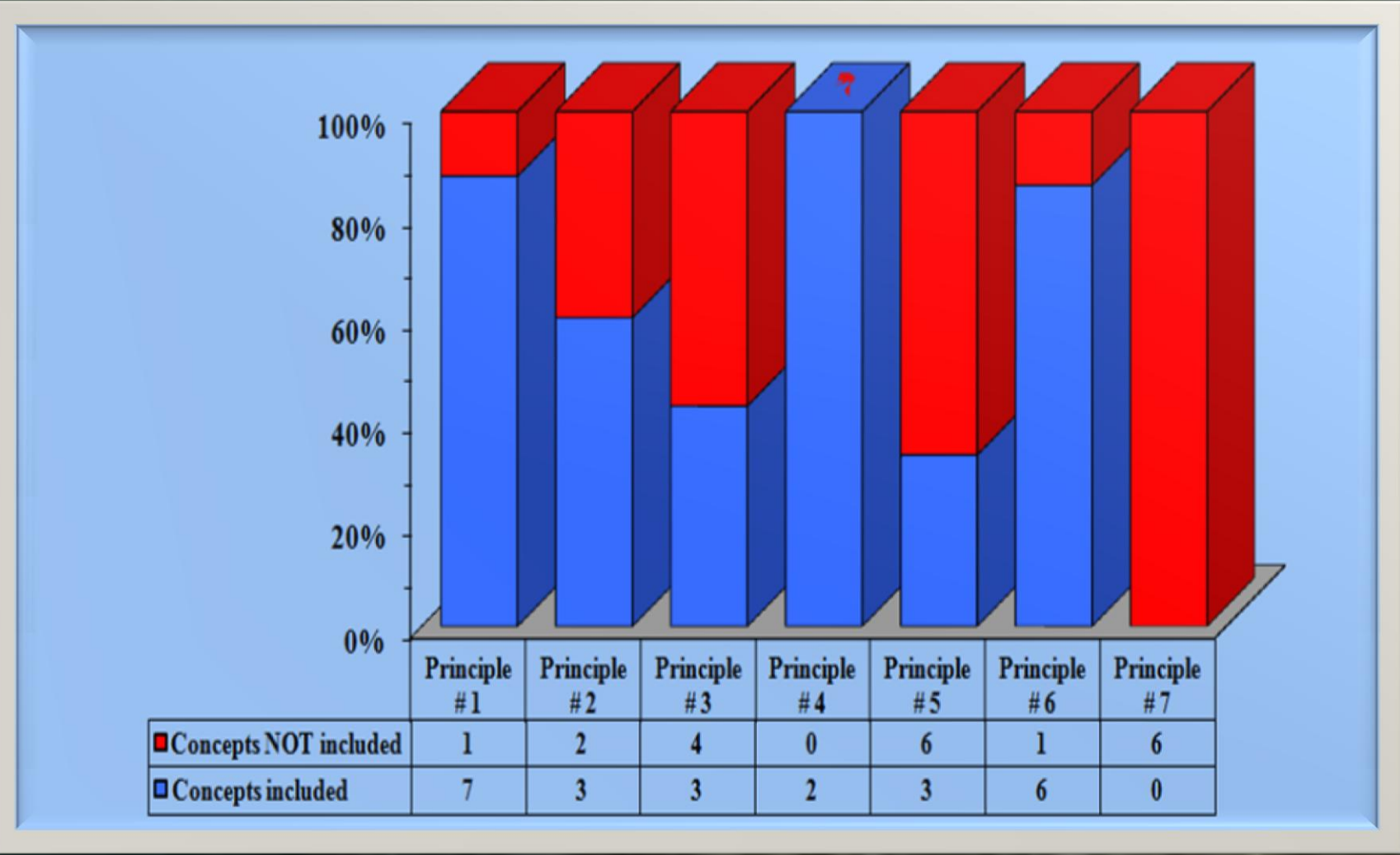


Table 4

Fundamental Concepts	Principle #1	Principle #2	Principle #3	Principle #4	Principle #5	Principle #6	Principle #7
A							
B							
C							
D							
E							
F							
G							
H							
I							

DISCUSSION

Tran et al. [12] support that in order to achieve an ocean and aquatic literate society, ocean and aquatic sciences must be valued and integrated into curricula and textbooks. During the last fifteen years, revisions in national curricula all over the world seem to be in progress; in almost all European countries, for instance, the focus has been upon the curricula, currently in place or in the process of being implemented [13], whilst in the USA we witness several endeavors, such as the establishment of the National Geography Standards in 1994 and the National Science Education Standards in 1996. In Greece, similar efforts of revising the existing curricula started in late 90s and were accomplished a few years later.

Under the prism of this recent revision, we examined the new Greek primary education textbooks used for teaching science, focusing on ocean issues. Summarizing, only six out of the seven ocean literacy principles are represented in textbooks, whereas elements of the last principle are totally absent. Furthermore, very few of the fundamental concepts are included in details, while most of the others are represented by an almost abstract and fragmented pattern with many inconsistencies within the same textbook or among different grades. These findings appear not to be in agreement with the Ocean Literacy Scope and Sequence for grades K-6, which is actually a practical tool showing how the ocean literacy principles could be taught at various grade bands and therefore the needs in recently revised Greek curricula, as far as ocean science issues is concerned, have not been met.

CONCLUSION

Greek primary education students receive little information from school textbooks about oceans and oceanic life, and their importance not only to our own well being, but to the welfare of the whole planet.