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Environmental literacy comparison between students taught in Eco-schools and ordinary schools in the Madeira Island region of Portugal

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ABSTRACT: The main goal of environmental education is to improve environmental literacy, including not just more knowledge but also a better attitude toward the environment and a higher prevalence of pro-environmental behaviours. The Eco-School Program is considered the world largest environmental education program for schools, but it keeps growing without proof of its particular effectiveness in improving environmental literacy. This study compares the level of environmental literacy on Madeira Island (Portugal) among 9th grade students from Eco-Schools and ordinary schools. It applies a questionnaire with three components, addressing knowledge, attitude and behaviour toward the environment. Results show that environmental literacy among 9th grade Eco-School students is not significantly higher than in ordinary schools. However, there are some features of environmental literacy that are slightly better in Eco-Schools, namely in knowledge, attitude and behaviours. Based on our findings, we conclude that the Eco-School Program is not really a better environmental education strategy than others strategies adopted in ordinary schools. Nevertheless, the present study fails to point out reasons for the results obtained since the design research is not adequate for this purpose.

KEY WORDS: Environmental education, environmental literacy, eco-schools program, new ecological paradigm.

INTRODUCTION

The goal of environmental education is, accordingly to the Belgrade Charter, to develop a world population that is aware of and concerned about the environment and its associated problems and, accordingly to the Tbilisi conference, to promote environmentally literate citizens who undertake environmentally friendly actions (UNESCO, 1980; Hungerford and Peyton, 1976). In fact, the development of an environmentally literate citizenry is an important aim of environmental education and environmental literacy is

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a fundamental prerequisite to maintain and improve the quality of the environment (Disinger & Roth, 1992).

In past decades, despite a common matrix, different authors have considered a wide spectrum of components to be included in environmental literacy, making its definition a dynamic undertaking (Hollweg et al., 2011). For example, Simmons (1995, pp. 55-58) identified seven elements of environmental literacy:

1. Affect (e.g., environmental sensitivity, attitudes, and moral reasoning);
2. Ecological knowledge;
3. Socio-political knowledge (e.g., the relationship of cultural, political, economic, and other social factors to ecology and environment);
4. Knowledge on environmental issues;
5. Skills pertaining to environmental problems/issues and action strategies, systemic thinking, and forecasting;
6. Determinants of environmentally responsible behavior (i.e., locus of control and assumption of personal responsibility);
7. Behavior (i.e., various forms of active participation aimed at solving problems and resolving issues).

Another framework example, created by Wilke (1995, pp. 5-6), defined four clusters of environmental literacy components: cognitive dimensions (knowledge and skill), affective dimensions, additional determinants of environmentally responsible behavior, and personal and/or group involvement in environmentally responsible behavior. Previously, Disinger and Roth (1992) suggested that environmental literacy was essentially the capacity to perceive and interpret the relative health of environmental systems and take appropriate action to maintain, restore, or improve the health of those systems. At that time, Roth (1992) considered that people should be able to demonstrate in some observable form what they have learned, namely their knowledge of key concepts, skills acquired, disposition toward issues, and the like, and emphasized that environmental literacy should be defined in terms of observable behaviors.

Nowadays, a common understanding is that environmental literacy must include:

- knowledge and understanding of environmental concepts, problems, and issues,
- a set of cognitive and affective dispositions, and
- a set of cognitive skills and abilities, together with the appropriate behavioral strategies to apply such knowledge and understanding in order to make sound and effective decisions in a range of environmental contexts (Hollweg et al., 2011).

As a simple definition, environmental literacy is a domain of four interrelated components: knowledge, dispositions, competencies and environmentally responsible behavior (Hungerford & Volk, 1990; Cook & Berrenberg, 1981; Stern, 2000; Hollweg et al., 2011). Despite this simplification, each of the above four components hold a complex structure that needs to be taken into consideration in environmental education practices, namely the fact that, among others,

- Knowledge should include physical, ecological, social, cultural and political systems,
- Dispositions involves sensitivity, attitudes, personal responsibility and motivation,
- Competencies implies identify, analyze, investigate, evaluate and resolve environmental issues, and that
- Environmentally responsible behavior includes practices in eco-management, persuasion, consumer/economic action, political action and legal action (Hollweg et al., 2011).

Since the main goal of environmental education is to improve environmental literacy, evaluating the efficiency of an environmental education program implies assessing the environmental literacy progression in the target population. However, the complex structure of environmental literacy makes it difficult to include all components in any single assessment, and thus it is of fundamental importance to identify the essential elements to be addressed in any survey. In this evaluation approach, several authors identified knowledge, attitude and environmentally responsible behavior as the major components of the environmental literacy to be included in surveys (Hallfreðsdóttir, 2011; Krnel & Naglič, 2009; Igbokwe, 2012; Mcbeth & Volk, 2010; Kuhlemeier et al., 1999; Pe'er et al., 2007).

Several environmental education programs exist around the world, with more or less effectiveness in promoting environmental literacy. Most approach youth and children in their educational context in schools (Mutisya & Barker, 2011; Bas et al, 2011). Since 1994, the Foundation for Environmental Education (FEE), a non-governmental and non-profit organization that promote sustainable development through environmental education, launch the Eco-Schools, an international program that aims to empower students, by engaging them in fun and action-oriented learning, to be the change needed for a sustainable world. The Eco-Schools Program assumes to be a way to improve students' learning outcomes, attitudes and behaviors on the environmental and sustainability challenges (Eco-Schools, 2013a). It follows a 7-step change process:

1. Eco-School committee;
2. Environmental review;

3. Action plan;
4. Monitoring and evaluation;
5. Curriculum work;
6. Informing and involving; and
7. Eco-code.

It centers the work in themes, especially water, waste and energy, but also nature and biodiversity, mobility, and climate change, among others. At the end of this process, successful schools are awarded with the Green-Flag (Eco-Schools, 2013b).

Presently, this environmental education program involves more than 11 million students across 52 countries, making *Eco-Schools* the largest sustainable schools *program* in the world (Eco-Schools, 2013a). Eco-Schools Program is implemented in Portugal since 1996 through the coordination of the Blue Flag of Europe Association (ABAE- Associação Bandeira Azul da Europa, in the Portuguese designation) and assumes as its objective to encourage actions and recognize the quality of the work developed by schools in the scope of environmental education (Gomes, 2013). In the school year of 2011/2012, the Eco-Schools Program in Portugal involved 1443 schools and about 800,000 students across the country, being Madeira Island the Portuguese district with the highest percentage of its public schools awarded with the Green-Flag (68%), representing almost 10% of all the national schools involved in the Program (ABAE, 2012).

Several studies have been developed in order to assess the contribution of Eco-Schools Program on the development of student's Environmental Literacy. Krnel and Naglič (2009) compared environmental literacy between Eco-Schools and ordinary schools of Slovenia and concluded that knowledge was the only component that showed a statistical significant improvement. In Iceland, a comparison of environmental knowledge, attitude and actions between students from Green-Flag schools and traditional schools showed that Eco-School students were more aware of environmental issues but did not have a significant better environmental knowledge or attitude. However, this study showed that, despite Eco-Schools Program having little effect on students' environmental knowledge and attitude, it could encourage, through situational factors, the pro-environmental actions directly linked to the facilities available in the school, namely recycling containers (Hallfreðsdóttir, 2011). In Flanders (Belgium), Pauw and Van Petegem (2011; 2013) found that Eco-Schools Program mainly influenced their students' environmental knowledge, but had no positive effect on environmental attitude and behavior, but Ozsoy and colleagues (2012), conducting research on private schools of Turkey, found a significant increase in students from eco-schools, not just in knowledge but also in environmental attitude.

METHODOLOGY

Research problem

This research arises from a need to know the results achieved with the Eco-Schools Program in an insular region of Portugal, where a huge effort to make every schools a green-flag establishment is in place. Madeira Island has already 68% of their public schools awarded with a green-flag and there is a public commitment to bring them altogether into the Program. However, until now, no evaluation has been undertaken on the effect of all this effort in the improvement of the students' environmental literacy. Conducting an evaluation is seen as an urgent task since, year by year, more schools have been included in the Eco-Schools Program and, soon, it will be difficult to find schools without a green-flag to form the basis for a comparison.

This study intends to determine to what extend the Eco-Schools Program is improving the environmental literacy components of knowledge, attitude and behavior among students.

To achieve these goals, three hypothesis were stipulated:

1. Student's knowledge on environmental issues is higher in Eco-Schools than in Non Eco Schools.
2. Student's pro-environmental attitude is higher in Eco-Schools than in Non Eco-Schools.
3. Student's environmentally responsible behavior prevalence is higher in Eco-Schools than in Non Eco-Schools.

Questionnaire

Despite being widely used instruments, and even with taking as much care as possible to improve its reliability and validity, questionnaires show some limitations, especially as a single method to understand complex learning processes, as such involved in the improvement of environmental literacy. However, since our main purpose, before understand its process, is to evaluate environmental literacy levels in students from different schools, questionnaires are seen as simple and widely applicable instruments that are adequate for this present research.

The survey design is based on the work of others, already used to assessing environmental literacy among students, but carefully adapting it to the local specificities and to the research goals (Krnel & Naglič, 2009; Hallfreðsdóttir, 2011; Pauw & Van Petegem, 2011; Pauw & Van Petegem, 2013; Oszoy et al., 2012). The proposed hypotheses are tested through an anonymous survey questionnaire with close-ended questions, designed especially for that purpose (Appendix 1). The questionnaire consists of a header for personal data and three main sections, each measuring and

assessing: knowledge (10 questions), attitude (15 questions) and environmentally responsible behavior (15 questions). The environmental knowledge section includes the three main themes of the Eco-School Program: water (3 questions); energy (3 questions); and waste (4 questions). The questions, designed to assess environmental knowledge, are mostly framed in three main aspects: cause of problems, regional context and behavior options. For each question, the respondents are confronted with different options and select the one deemed correct. The section that measures pro-environmental attitude is constructed with the 15 questions of the New Ecologic Paradigm (NEP) Scale, an instrument widely used and validated in the measurement of pro-environmental orientation (Dunlap et al., 2000; Ogunbode, 2013; La Trobe & Acott, 2000; Watne et al., 2012; Shoukry et al., 2012; Ogunjinmi et al., 2012; Kostova et al., 2011).

In the third section of the questionnaire, environmentally responsible behaviors are assessed through statements that span across the three main themes of the Eco-Schools Program: water (4 statements), energy (6 statements) and waste (5 statements). The statements address everyday behaviors and, to each, students are asked to define the frequency of their practices in a Likert-type scale instrument ranging from 1 (never) to 5 (always). The behaviors in the questionnaire are adapted to the students' context and, besides the anonymity of the enquiries, special care is taken to overcome potential social desirability bias that can appear in self-reported assessments (Bryman, 2004, p.134; Nederhof, 1985). As much as possible, the statements in this section are written in a neutral form and are short enough to avoid any incentive for diagonal readings. Also, the questionnaires are self-administered in the same way the evaluation tests for each discipline are applied in the classrooms, except that they are anonymous. Additionally added is an indirect statement ["l) in school, my colleagues throw garbage on to the floor"] and, in order to obtain an internal validity indicator, two redundant questions are added ["a) I put paper, glass bottles and plastic bags in different containers" and j) "I put all kind of waste in the same container"]. The statements for each of the three main Eco-Schools Program themes are intermingled in this section, and statements of positive and negative environmental behaviors are alternated.

The questionnaire was pre-tested on a sample of 9th grade students included in the Eco-Schools Program and, as a result, changes were made to address problems found in the first section. The final version of the questionnaire was applied to all sample students between April and May 2013, after informed consent from each school board.

Participants

The sample included 491 9th grade students from five elementary schools on Madeira Island, 3 of them Eco-Schools for at least the past 5 years and 2 others never included in the program. The questionnaire was applied to

almost all the 9th grade students of the educational establishments involved in the survey, which, as a rule, were students that remained in the same establishment for the five years that it took to complete studies between 5th and 9th grade.

Data analysis

Data collected in the survey was analyzed with SPSS (version 20) statistical software. Accordingly to the student's responses, the data were converted, for the items in the attitude and behavioral domains, to numeral scores ranging from 1 to 5, , and, for knowledge, scored "1" or "0" if answers were correct or incorrect, respectively. In some analyzes, the input files for attitude and behavior were constructed with scores normalized as if all questions were environmentally positive. Blank responses were scored as missing values.

The reliability (the Cronbach's Alpha score was 0.705 for the entire measuring instrument) and validity [confirmed by factor analysis and internal validity indicator questions that show a significant positive correlation ($r=0.641$ $p=0.000$)] were evaluated followed by a set of descriptive statistics: mean, standard deviation, and standard error of the mean. Q-Q plot graphical measure and Kolmogorov-Smirnov test were used to test the normality of distribution before any factor analysis of numerical variables was carried out.

The aim of the analysis was to compare environmental knowledge, attitudes and pro-environmental behavior between Eco-Schools and Non-Eco-Schools students. For each of the three data domains (knowledge, attitude and behavior), item by item and total average student's scores were calculated for Eco-School and Non-Eco-School students. For knowledge, the frequency of correct answers in total and for each theme (water, energy and waste) was calculated and compared between Eco-Schools and Non-Eco-Schools students. With the data collected from the questionnaire's attitude section, the total attitude score were calculated in each of the two categories of schools and also in concordance with the New Ecological Paradigm (NEP), with the Dominant Social Paradigm (DSP) and those that are undefined. Also, NEP scale questions were subdivided by its five group items: limits to growth (Q1, Q6, Q11), anti-anthropocentrism (Q2, Q7, Q12), fragility of nature's balance (Q3, Q8, Q13), rejection of exemptionalism (Q4, Q9, Q14), and possibility of an eco-crisis (Q5, Q10, Q15); and the concordance prevalence in each of Eco-Schools and Non-Eco-Schools was calculated and compared. The pro-environmental behaviors prevalence in Eco-Schools and Non-Eco-Schools students was calculated overall and for each of the themes - water, energy and waste.. Significance was addressed through independent sample t-test (2-tailed) when comparing means and one sample z-test of proportions (2-tailed) when comparing prevalence, with a confidence level of 95%. A one-way

analysis of variance (ANOVA) was used to identify significance between groups.

RESULTS

The 9th grade students involved in this survey are distributed between Eco-Schools (ES) (n=220) and Non-Eco-Schools (NES) (n=271). In each group, males and females are evenly distributed with a 52% and 48% distribution in NES, respectively, and a 50% equally distribution in ES. The mean age of students was 15.06 years old in ES and 15 in NES. The participation in a school's environmental activities is significantly higher among Eco-School students (33.9%) than among Non-Eco-School students (9.9%) (p=0.000). Marks obtained in the 8th grade Natural Sciences discipline were not significantly different between ES (3.64) and NES (3.58) (p=0.39) (on a 5 point scale). Missing values account for 4.2% in ES and 2.1% in NES.

Knowledge

Correct answers in the knowledge section reach a similar score between Eco-Schools (71.9%) and Non-Eco-Schools (71.7%) (p=0.79), despite 9th grade Eco-School students showing a significantly better knowledge for the theme of water (p=0.009) (Table 1).

Table 1 Average percentages of correct answers in the knowledge section, for total, water, energy and waste themes in Eco-Schools (ES) and Non-Eco Schools (NES), 9th grade students. Bold type shows the highest frequencies.

Themes	ES	NES	Significance
Water	**69.3%**	62.8%	p=0.009
Energy	**73.5%**	71.2%	p=0.170
Waste	71.7%	**73%**	p=0.140
Total	**71.9%**	71.7%	p=0.790

Considering knowledge on how to save energy (question 6) (correct answers ES=86.9% and NES=85.2%, p=0.29) or how to segregate wastes for recycling (question 9) (correct answers ES=72.4% and NES=72.2%, p=0.89), knowledge of much relevance to pro-environmental behaviors, the percentage of correct answers are high, but with no significant differences between Eco-School and Non-Eco-School students. However, some specific knowledge about waste management showed significant differences between ES and NES, mostly in favor of Non-Eco-School Students (Table 2).

Students with better marks on the 8th grade Natural Sciences test (4 or 5 values) point to similar levels of knowledge in ES and NES (both with

73.6% correct responses, p=1). This is despite the fact that responses to four specific questions show significant differences; two with better results re-ES students (*abundance of water resources*: ES= 64.2%, NES=29%, p=0.000 and *where to put broken window glass*: ES=12.8%, NES= 7.8%, p=0.031) and another two for NES students (*returnable packaging allows reducing waste*: ES=59.3%, NES=78%, p=0.000; and *disposable products increase waste production*: ES=76.3%, NES=84.8%, p=0.038).

Table 2 Percentages of correct answers for specific knowledge that shows significant differences between Eco-Schools (ES) and Non-Eco-Schools (NES) 9th grade students. Bold type shows the highest frequencies.

Questions	ES	NES	Significance
Returnable packaging allows reducing waste?	58.6%	**65.3%**	p=0.029
For each sheet of paper, should we use only one side?	82.9%	**89.4%**	p=0.036
When sorting the garbage, where should we put a newspaper?	95.4%	**98.2%**	p=0.045
When sorting the garbage, where should we put broken window glass?	**12.3%**	7.1%	p=0.036
When sorting the garbage, where should we put a packet of crisps?	64%	**74.9%**	p=0.049
Which is the symbol that means "put in the garbage bin"?	**99.5%**	97.4%	p=0.050

Attitude

In a five point scale for attitude towards the environment, where 1 and 2 relate to the Dominant Social Paradigm- DSP), 3 is Undefined, and 4 and 5 relate to the New Ecological Paradigm - NEP, ES and NES students score the same value, 3.59 points (p=1). This indicates that, on average in any of the two groups, the 9th grade students from Madeira Island places themselves between Undecided and pro New Ecological Paradigm attitudes (data not shown). Students from Eco-Schools show significant concordance with three of the five NEP scale facets of an ecological worldview, namely the existence of "limits to growth", the "fragility of nature's balance" and with the "possibility of an eco-crisis" (Table 3).

The Pro New Ecological Paradigm attitude is not significantly different between Eco-Schools (59.3%) and Non-Eco-Schools (57.4%) (p=0.105) (Table 4). The only NEP scale statement with statistical significant differences between ES (94.6% of concordance) and NES (86.2% of concordance) was "*plants and animals have as much right as*

humans to exist" (p=0.038) (data not shown). Surprisingly, the pro Dominant Social Paradigm (DSP) attitude is significantly higher in 9th grade Eco-School students (19.5%) than in those from Non-Eco-Schools (17.6%) (p=0.04). An Undecided attitude towards the environment is significantly higher in NES (25%) than ES (21.3%) (p=0.000) (Table 4).

Table 3 The Pro New Ecological Paradigm (Pro NEP) attitude prevalence in 9th grade students from Eco-Schools (ES) and Non-Eco-Schools (NES) for each of the 5 NEP scale worldview facets. Statistical significant differences are given in bold.

	Pro NEP attitude prevalence's (%)		
NEP worldview facets	**ES**	**NES**	Significance
Limits to growth	**49.3**	**44.1**	**0.05**
Anti-anthropocentrism	73.6	71.1	0.29
Fragility of nature's balance	**72.2**	**67.4**	**0.05**
Rejection of exemptionalism	51.2	50.9	0.91
Possibility of an eco-crisis	**63.9**	**55.9**	**0.00**

Table 4. Average percentages of pro New Ecological Paradigm (NEP), pro Dominant Social Paradigm (DSP) and Undecided attitudes in 9th grade students by Eco-Schools (ES) and Non-Eco-Schools (NES). Statistical significant differences in bold.

Attitudes towards the environment			
	Pro-NEP	**Pro-DSP**	**Undecided**
ES	59.3%	**19.5%**	**21.3%**
NES	57.4%	**17.6%**	**25%**
Significance	p=0.105	**p=0.04**	**p=0.000**

Behavior

In a five point scale for practices of pro-environmental behaviors (1-Never, 2- Rarely, 3-Sometimes, 4- Very Often, 5- Always), the scores by ES students (3.39) and NES (3.34) are similar (p=0.98), which means that, on average in ES or NES, 9th grade students place themselves as practicing pro-environmental behaviors, with a prevalence between 'sometimes' and 'very often' (data not shown). Despite overall results not being statistically different between ES and NES students, there are specific features of pro-environmental behaviors prevalence that need to be underlined. The prevalence of students from ES that 'never' (9.8%) practice pro-environmental behaviors is significantly lower than those from NES

(12.3%) (p=0.0007). However, the percentage of students that only practice it on a 'rarely' basis is statistically higher in ES (15.6%) than in NES (13.8%) (p=0.03) (Table 5). Also, if we take together 'never' and 'rarely' prevalence as an indicator of a lowest pro-environmental behavior commitment, there are no significant differences between ES (25.4%) and NES (26.1%) (p=0.5).

Table 5 Pro-environmental behaviours prevalence for total, water savings, energy savings and wastes management in 9th grade students from Eco-Schools (ES) and Non-Eco-Schools (NES). Statistical significant differences in bold.

	Pro-environmental behaviors prevalence - Water				
	Nev	Ra	Some	Ver	Al
ES	10.4	**11.**	16.8	20.	41
NES	12.2	**8.9**	20.1	19.	39.
Signifi	p=0.	**p=**	p=0.0	p=0	p=
	Pro-environmental behaviors prevalence –				
	Nev	Ra	Some	Ver	Al
ES	**11.4**	16.	26.6	**24.**	20.
NES	**14.9**	15.	28.2	**21.**	20.
Signifi	**p=0.**	p=	p=0.3	**p=0**	p=
	Pro-environmental behaviors prevalence –				
	Nev	Ra	Some	Ver	Al
ES	7.5%	17	31.6	23.	19.
NES	9.3%	16	30.2	23.	20.
Signifi	p=0.	p=	p=0.4	p=1	p=
	Pro-environmental behaviors prevalence – Total				
	Nev	Ra	Some	Ver	Al
ES	**9.8**	**15.**	25.6	23.	25.
NES	**12.3**	**13.**	26.7	21.	25.
Signifi	**p=0.**	**p=**	p=0.2	p=0	p=

Considering pro-environmental behaviors separately in each of the three areas evaluated (water savings, energy savings and waste management), there are no statistical significant differences between the means scores obtained on the five point scale for ES and NES students.

Water savings: 3.7 in ES, 3.65 in NES, p=0.62;

Energy savings: 3.27 in ES, 3.17 in NES, p=0.26;

Waste management: 3.29 in ES, 3.31 in NES, p=0.83).
However, for water saving and energy saving, there are significant differences in some specific pro-environmental behaviors prevalence levels. In fact, for water saving, students from ES show a significantly higher 'rarely' practices (p=0.05) and, for energy saving, the prevalence of ES students that 'never' practice pro-environmental behaviors are significantly lower than by NES students (p=0.005) (Table 5). Also, for energy saving, students from ES reveal a significantly higher 'very often' practices of pro-environmental behaviors than NES students (p=0.016) (Table 5).

DISCUSSION

Environmental education main goal is to improve environmental literacy. Despite the great diversity of environmental education programs around the world, there is a common feature among all of them, a lack of evaluation on their effectiveness to reach their goals: promote more knowledge, better attitude and a higher prevalence of pro-environmental behaviors (Disinger and Roth, 1992). Eco-Schools are, presently, the largest environmental education program in the world, involving more than 11 million students across 52 countries. As other environmental education programs, Eco-Schools main goal is to improve environmental literacy among students. However, several studies has shown that this goal still has a long way to go to be achieved and, because of that, the program needs to be better evaluated in what concerns to its real contribution to the environmental literacy (Hallfreðsdóttir, 2011; Pauw and Van Petegem, 2011; Pauw and Van Petegem, 2013; Ozsoy et al., 2012).

The fact that present study evaluates the level of environmental literacy among 9th grade students attending the same eco-school for a period of, at least, five years, allows us to evaluate children that were involved on this environmental education program since their 6/7 years old until 14/15 or more, which gives more consistency to the comparisons. However, the survey questionnaire used does not allow specific understanding of some environmental literacy features found, indicating a need for other methodologies in future studies.

The finding that eco-school students participate more in environmental activities than students from ordinary schools can be explained with the expected higher dynamism brought by the environmental education program. However, despite this highest dynamism of eco-schools, only one third of their 9th grade students admit having participated in environmental activities along past years, which can reflect a deficient integration of the Eco-Schools Program within the school community. It seems that Eco-Schools Program activities do not reach the majority of students or, at least, that they are not sufficiently striking, to the point that they still remember

them. Additionally, the Eco-Schools Program seems not to influence positively the 8th grade marks on Natural Sciences, despite it usually being the core discipline for the Eco-schools dynamics.

Our study shows also that there are no consistent higher influences of Eco-Schools Program in the level of environmental knowledge of 9th grade students of Madeira Island. In general, there are no significant differences between both groups and also the few specific knowledge, in which we found differences, are evenly distributed between ES and NES students. The 9th grade students from ES have shown a significantly higher knowledge in water thematic but, surprisingly, worse than NES students for some specific knowledge in waste management. However, despite all the evidence that does not allow us to accept the hypothesis that "students' knowledge about environmental issues is higher in eco-schools than in non-eco-schools," our results show a good level of knowledge in both groups. Again, results from attitude evaluation through the New Ecological Paradigm scale does not show, in general, differences between ES and NES students. However, the evaluation shows that the majority in both groups places themselves in a pro New Ecological Paradigm attitude, which is in concordance with the profile found for knowledge. This predominant pro New Ecological Paradigm attitude, equally in ES and NES, needs to be further addressed in order to know if ordinary schools does had in place environmental education programs that could justify these results or if it is a consequence of outside school influences.

The fact that a pro Dominant Social Paradigm attitude is significantly higher in ES also contributes to reject the hypothesis that student's pro-environmental attitude is higher in Eco-Schools than in Non-Eco-Schools. However, since the prevalence of pro New Ecological Paradigm attitude is similar between ES and NES, this higher concordance with Dominant Social Paradigm for 9th grade ES students should be also a consequence of their lower undecided levels. Nevertheless, ES students statistically higher levels of concordance with the existence of "limits to growth", with the "fragility of nature's balance" and with the "possibility of an eco-crisis" show that they are in a better position than NES to increase their level of concordance with the New Ecological Paradigm.

Pro-environmental behavior evaluation also, as for knowledge and attitude, rejects the hypothesis that 9th grade ES students have a better performance than NES. Despite not statistically different between ES and NES 9th grade students, almost 50% of them assumes to practice pro-environmental behaviors in a 'always' and 'very often´ basis. The most evident differences between ES and NES student behaviors are related to the distribution of 'rarely' and 'never' prevalence. Despite ´rarely´ and 'never' prevalence, summed together, resulting in a similar percentage among ES and NES students, there is a significantly different distribution in both groups with a highest prevalence of 'never' in ES and 'rarely' on

NES. This could mean that the Eco-Schools Program makes some difference among the students most reluctant to engage in pro-environmental behaviors, leading some to do it, at least, 'rarely'.

Pro-environmental behavior prevalence in each one of the three areas (water, energy and wastes) also does not distinguish between ES and NES. However, water and energy saving behaviors show differences in some prevalence levels, favoring ES students, which could be an achievement of the Eco-Schools Program. In this particular, we could see that the 'never-rarely' balance shown above is particularly evident in water and energy saving behaviors. This 'never-rarely' balance effect, together with the 'very often higher' prevalence of pro-environmental behaviors in ES for energy savings, reveals that Eco-Schools Program could be responsible for a slightly better performance on pro-environmental behaviors. However, despite special care were taken to overcome potential social desirability bias that could overcome in self-reported assessments, we should also consider the possibility that this slightly better behavior in ES students could be a consequence of that sort of effects.

Considering the interesting levels of knowledge, attitude and behavior towards the environment, found equally in ES and NES 9*th* grade students in Madeira Island, we can´t say that Eco-Schools Program is failing its purpose but, most probably, that ordinary schools does also develop their own specific environmental education programs and strategies with similar results. In fact, facing these results, and in order to enlighten why there are no substantial differences between ES and NES 9th grade students environmental literacy, as also the low range of the eco-schools activities among their students, a new survey should be developed in order to characterize the environmental education programs or activities in place in both groups of schools. Also, despite our study, as others before, does not shown significant environmental literacy differences between ES and NES, there are some evidences of a slightly better performance on students from schools engaged in the Eco-Schools Program. The new survey suggested above should also clarify the differences on the environmental education programs in place that could support these slight differences. Together with this, the socio-cultural and economic school surroundings should also be evaluated as also environmental education programs or activities developed outside the school, namely by the municipalities or environmental non-governmental organizations. Another hypothesis that needs to be evaluated is the influence of the disciplinary curriculum on student's environmental literacy. In fact, it is known that disciplinary curriculum in Portugal, with a common structure for all schools, includes environmental education contents in some specific disciplines along basic education, which could influence students environmental literacy (Tracana et al, 2012).

CONCLUSIONS

There are no clear differences between ES and NES in environmental literacy, which make us to conclude that Eco-Schools Program does not represent a much better environmental education instrument than what is commonly done in ordinary schools. The results of our environmental literacy evaluation among 9th grade students from Madeira Island (Portugal), engaged and outside Eco-Schools Program, are in agreement with previous studies (Krnel and Naglič, 2009; Hallfreðsdóttir, 2011; Pauw and Van Petegem, 2011; Pauw and Van Petegem, 2013; Ozsoy et al., 2012). In fact, most of the previous studies shown that Eco-Schools Program does not increase significantly environmental literacy among students, revealing only the ability to improve slightly some knowledge and attitudes. Also, the present study has shown an analogous effect of the Eco-Schools Program in Madeira Island, although part of its achievement could be mask by a similar efficiency of others environmental education strategies developed in ordinary schools, as also the influences of the disciplinary curriculum environmental education contents and the contribution of the outside school context. Our study has shown that students integrated in the Eco-Schools Program for at least 5 years have a slightly better performance in some aspects of knowledge, attitude and behaviors. It is interesting to note that the thematic areas in which, somehow, ES 9th grade students distinguished themselves from NES are, both in knowledge and behavior, water and energy, in wastes ES students doesn't revealed any signs of a better performance. This could reveal that different contributions in and out school context is influencing student's environmental literacy, which needs to be clarified by further studies.

Since the level of environmental literacy could be considered satisfactory in 9th grade students from Madeira Island, both in ES and NES, future studies should be developed in order to characterize the environmental education programs and activities, both in eco-schools, ordinary schools and outside the school context, to enlighten the reasons that justify the results of present study.6. Acknowledgments

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APPENDIX: QUESTIONNAIRE

School Name: _____
Age: _____ Gender: ☐M ☐ F School Year: 9ª grade

What was your mark in the 8th grade Natural Sciences discipline?
1 ☐ 2 ☐ 3☐ 4 ☐ 5☐

Along the last few years, have you participated in environmental activities at school?
☐Yes ☐No

1. In the region you live, water is a resource (choose only one answer):
☐a) Absent ☐b) Rare ☐c) Sufficient ☐d) Abundant

2. What is the worst threat to water resources? (choose only one answer):
☐ a) Soil impermeabilization.
☐ b) Lack of rain and high temperatures.
☐ c) Excessive consumption, waste and pollution.
☐ d) The high prices.

3. In which of the following functions do we use more water? (choose only one answer):
☐ a) To drink.
☐ b) To wash dishes in the kitchen.
☐ c) To personal hygiene in the bathroom.
☐ d) To cook.

4. What are the most used energy sources in Madeira Island? (choose only one answer):
☐ a) Renewable energy (hydro, wind and solar- environmentally friendly energy).
☐ b) Fossil fuels (oil and gas- polluting energy).

5. Which of the following activities or situations contributes more severely to pollute the air we breathe daily in our society? (choose only one answer):
☐ a) Forest fires ☐ b) Industry ☐ c) Incineration ☐ d) Transports

6. Select for each of the activities listed below which option represents a LOWER power consumption.

Activity	Option 1	Option 2	Option with LESS energy consumption
Switching off TV:	On TV button	On remote control	
Illumination:	 Incandescent lamps	 Fluorescent lamps	
Transports:	Car	Bus	
Alimentation:	Regional products	Imported products	

7. In the last decades the wastes production in Madeira Island (choose only one answer):
☐ a) Decreased ☐ b) Remained stable ☐c) Increased ☐ d) Oscillated

8. Tick the statements with which you agree (choose as many as you want):
☐ a) We must put the trash in the appropriate containers.
☐ b) Waste management is an exclusive responsibility of public entities.
☐ c) The waste segregation is easier if we put everything in the same container.
☐ d) When we walk in nature, we must bring back the garbage with us.
☐ e) Returnable packaging will reduce the production of waste.
☐ f) On school works, we should use only one page per sheet of paper.
☐ g) Disposable products contribute to increase waste production.
☐ h) Without trash on the floor, the staff responsible for cleaning will lost their jobs.

9. To recycle is necessary to selectively collect the wastes. Match the items of the two columns correctly:

Newspaper •	
Diaper •	• Vidrão (green container)
Windows glass •	
Packet of crisps •	• Papelão (blue container)
Notebook •	
Tea cup •	• Embalão (yellow container)
Soda can •	
Plastic bag •	• Container for unsorted trash
Glass botlle •	

10. Match the symbols with their meanings:

a) Included in the evaluation and recycling system for packaging

b) Flatten the empty packaging

c) Recyclable material

d) Put in the bin

11. Mark with X your level of concordance with the following statements:

a) We are approaching the limit of the number of people the Earth can support.
☐ Strongly Disagree ☐ Mildly Disagree ☐ Unsure
☐ Mildly Agree ☐ Strongly Agree

b) Humans have the right to modify the natural environment to suit their needs.
☐ Strongly Disagree ☐ Mildly Disagree ☐ Unsure
☐ Mildly Agree ☐ Strongly Agree

c) When humans interfere with nature it often produces disastrous consequences.
☐ Strongly Disagree ☐ Mildly Disagree ☐ Unsure
☐ Mildly Agree ☐ Strongly Agree

d) Human ingenuity will insure that we do not make the Earth unlivable.
☐ Strongly Disagree ☐ Mildly Disagree ☐ Unsure
☐ Mildly Agree ☐ Strongly Agree

e) Humans are seriously abusing the environment.
☐ Strongly Disagree ☐ Mildly Disagree ☐ Unsure
☐ Mildly Agree ☐ Strongly Agree

f) The Earth has plenty of natural resources if we just learn how to develop them.
☐ Strongly Disagree ☐ Mildly Disagree ☐ Unsure
☐ Mildly Agree ☐ Strongly Agree

g) Plants and animals have as much right as humans to exist.
☐ Strongly Disagree ☐ Mildly Disagree ☐ Unsure
☐ Mildly Agree ☐ Strongly Agree

h) The balance of nature is strong enough to cope with the impacts of modern industrial nations.
☐ Strongly Disagree ☐ Mildly Disagree ☐ Unsure
☐ Mildly Agree ☐ Strongly Agree

i) Despite our special abilities, humans are still subject to the laws of nature.
☐ Strongly Disagree ☐ Mildly Disagree ☐ Unsure
☐ Mildly Agree ☐ Strongly Agree

j) The so-called "ecological crisis" facing humankind has been greatly exaggerated.
☐ Strongly Disagree ☐ Mildly Disagree ☐ Unsure
☐ Mildly Agree ☐ Strongly Agree

k) The Earth is like a spaceship with very limited room and resources.
☐ Strongly Disagree ☐ Mildly Disagree ☐ Unsure
☐ Mildly Agree ☐ Strongly Agree

l) Humans were meant to rule over the rest of nature.
☐ Strongly Disagree ☐ Mildly Disagree ☐ Unsure
☐ Mildly Agree ☐ Strongly Agree

m) The balance of nature is very delicate and easily upset.
☐ Strongly Disagree ☐ Mildly Disagree ☐ Unsure
☐ Mildly Agree ☐ Strongly Agree

n) Humans will eventually learn enough about how nature works to be able to control it.
☐ Strongly Disagree ☐ Mildly Disagree ☐ Unsure
☐ Mildly Agree ☐ Strongly Agree

o) If things continue on their present course, we will soon experience a major ecological catastrophe.
☐ Strongly Disagree ☐ Mildly Disagree ☐ Unsure
☐ Mildly Agree ☐ Strongly Agree

12. Indicate by check mark how often you develop the following practices:

a) Put paper, glass bottles and plastic bags in different containers.
☐ Never ☐ Rarely ☐ Sometimes ☐ Very often ☐Always

b) While I wash my teeth, I leave the tap running.
☐ Never ☐ Rarely ☐ Sometimes ☐ Very often ☐Always

c) When I'm hungry, before I open the refrigerator door I know what I'll get.
☐ Never ☐ Rarely ☐ Sometimes ☐ Very often ☐Always

d) Instead of drinking tap water, I drink bottled water.
☐ Never ☐ Rarely ☐ Sometimes ☐ Very often ☐Always

e) Instead of taking a bath, I prefer a shower.
☐ Never ☐ Rarely ☐ Sometimes ☐ Very often ☐Always

f) To any location that I need to go, I ask my parents to take me by car.
☐ Never ☐ Rarely ☐ Sometimes ☐ Very often ☐Always

g) In dirty places, I lay waste to the ground.
☐ Never ☐ Rarely ☐ Sometimes ☐ Very often ☐Always

h) While I apply shampoo, I close the shower.
☐ Never ☐ Rarely ☐ Sometimes ☐ Very often ☐Always

i) I leave the lights on even when no one is using.
☐ Never ☐ Rarely ☐ Sometimes ☐ Very often ☐Always

j) I put all kinds of waste in the same container.
☐ Never ☐ Rarely ☐ Sometimes ☐ Very often ☐Always

k) In the bathroom, I avoid unload the toilet unnecessarily.
☐ Never ☐ Rarely ☐ Sometimes ☐ Very often ☐Always

l) At school, I see my colleagues throwing trash on the floor.
☐ Never ☐ Rarely ☐ Sometimes ☐ Very often ☐Always

m) At home, I turn off the television with the remote control.
☐ Never ☐ Rarely ☐ Sometimes ☐ Very often ☐Always

n) I go to school on foot or by bus.
☐ Never ☐ Rarely ☐ Sometimes ☐ Very often ☐Always

o) I have a preference for products from abroad (imported).
☐ Never ☐ Rarely ☐ Sometimes ☐ Very often ☐Always