

Environmental Education Program as a Tool to Improve Children's Environmental Attitudes and Knowledge

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Abstract Environmental education is a way to achieve the sustainable development and preserve nature. One of the aims of environmental education is to improve student's environmental attitudes because this is expected to improve pro-environmental behaviors. To change environmental attitudes is a challenge to educators and some proposals have been made in the last decades. The main objective of this work was to analyze the effectiveness of an environmental education program as a way of boosting the students' environmental attitudes and knowledge. The sample consisted of 82 eighth and ninth grade students of a public elementary school located in Brazil, divided into two groups (participants and non-participants). Results indicated a shift in the participants' environmental attitudes to a more pro-environmental way and an improvement in the students' environmental knowledge, whereas non-participants did not change their attitudes and knowledge during the year. Finally, neither gender nor grade influenced the students' environmental attitudes. Our results suggest that the participation in environmental education program guided activities can be effective to improve the students' pro-environmental attitudes and knowledge.

Keywords Environmental attitudes, Environmental knowledge, Environmental program, Environmental education

1. Introduction

The humankind activity affects the environment directly and indirectly. The indiscriminate use of the natural resources to produce several goods can cause environmental imbalance [1-3]. After the findings that the natural resources are finite and their preservation is needed to support humankind, environmental movements are debating and working to develop behavioural attitudes that will support the sustainability [4].

To attain behavioural changes, it is necessary that the individual's attitudes toward the attitudinal object change too [5]. According to the assumption of the Theory of Reasoned Action proposed by [6], the behaviours are indirectly related to the attitudes toward the behavioural intentions. The behaviour is determined by the intention to execute it and the intention is determined by the attitudes about the attitudinal object. Here in the present study, the environment is the object in question. In this way, it is assumed that the pro-environmental behaviours are predicted by the pro-environmental behavioural intentions that, in turn, are predicted by the pro-environmental attitudes [7].

The behavioural intentions are understood as the predispositions of an individual to engage himself in a specific behaviour [8, 9]. On the other hand, pro-environmental attitudes are defined as a set of values and actions that renders the individual aware of the environment. Finally, pro-environmental behaviours are defined by Corral_Verdugo [10] as the collection of actions that leads to the environmental protection. As the attitudes are not directly observable [11, 12], they can be inferred by the self-reported behavioural intentions.

The sustainable development involves daily practices that preserve a balanced human-nature relationship and consider the human's actual and future needs. In this way, it is assumed that individuals with high concerns toward the sustainability will engage themselves into pro-environmental actions.

The results of the unconcerned human activity towards the environment are considered a threat to the future of the planet. Consequently, it is necessary to develop attitudes and pro-environmentally oriented behaviours, since the attitudes and knowledge will determine the individual's environmental competence [13]. In this regard, the school can have an important role to attain this end. Pro-environmental attitudes are those that will preserve the environment [5].

The relevance of the education on the development of the pro-environmental attitudes is obvious [14]. Stapp et al [14] established the term environmental education as the

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educational practices related to the environmental theme. The environmental education has a crucial role in the achievement of the sustainable development.

The goals of the environmental education were established in the Tbilisi Conference in 1977. One of the goals is to develop positive attitudes toward the environment and individuals with pro-environmental attitudes are those that will promote the environmental preservation and diffuse pro-environmental attitudes and behaviours [15, 16]. Therefore, the environmental education aims to literate the students regarding the environment and its preservation [17].

In Brazil, the environmental attitudes are expected to have a role in the basic education. According to the National Common Curricular Base [18], every Brazilian student should have access to environmental attitudes content. The attitudes possess a cognitive component [19] that is related to the individual's knowledge about the attitudinal object [20]. In this way, another aim of the environmental education is to increase the student's knowledge about the environment. Accordingly, the individual's knowledge about the environment is positively associated with pro-environmental attitudes [21-24].

Of particular educational importance, the efficacy of environmental programs dedicated to teach environmentally-friendly practices associated with theoretical lessons has been demonstrated by different authors [24-29]. For example, the study performed by Liefländer and Bogner [30] indicated that participation in short and long-term environmentally-friendly programs positively influenced the preservation attitudes of primary school students in Germany. Similarly, the perceptions of American students have been demonstrated to be more pro-environmental after the participation in an environmental programs [31].

In Brazil, few studies about the environmental attitudes have been performed [32-34]. In this context, the objective of this study was to analyse how the participation in an environmental education project influenced the student's environmental attitudes and knowledge. Specifically, we aimed to test the following hypothesis:

1. The participation in the environmental education program will enhance the student's environmental attitudes as well as their knowledge about the environment in comparison with students who will not participate in the program.
2. Environmental knowledge will be positively related to the student's environmental attitudes.
3. The environmental attitudes of the female students

will be significantly higher than that of the male students.

4. The environmental attitudes of the older students will be significantly higher than that of younger students.

2. Methodology

2.1. Participants

The students that composed this sample are described in Table 1. The total number of participants was 82 elementary students divided into two groups: Participants and nonparticipants of the environmental program. The students that answered the instrument and participated in the program are those enrolled in the ninth and eighth grades an public elementary school located in Rio Grande do Sul state, Brazil.

2.2. The Environmental Program

Our environmental education program was called "Ações sustentáveis no ambiente escolar" (Sustainable practices in the scholar environment) and it was realized along the scholar year of 2017, one day each week, in the opposed turn of the student's regular classes. During the year, the student's participants in the environmental program performed some guided activities related to school waste (mainly on how to recycle/manage paper and food) and environmentally-friendly practices (for instance, how could them promote the diffusion of their practices to the other students of the school).

2.3. Data Collection

Data were collected at the beginning and at the end of the year of 2017. Environmental attitudes were measured via an instrument composed of 11 items describing pro-environmental attitudes, with a Cronbach α of 0.9. Environmental Knowledge was measured using the Children's Environmental Knowledge and Attitudes Scale [35]. Only 15 items of the knowledge component of this scale were used, once these items are equivalent to the Brazilian curricular context.

2.4. Data Analysis

Data were analyzed by four-way ANOVA [2 gender X 2 grades X 2 participation/non-participation in the program X beginning and end of the year (repeated measures)] with repeated measures to measure differences in the attitudes and knowledge between the two groups that composed this study. Linear Regression was performed to analyze the relationship between student's environmental attitudes and knowledge.

Table 1. Distribution of students in the groups of participants and non-participants

N	Girls (%)	Boys (%)	8 th Year (%)	9 th Year (%)	Participants (%)	Non-participants (%)
82	43,9	56,1	47,56	52,44	42,68	57,32
	N = 36	N = 46	N = 39	N = 43	N = 35	N = 47

3. Results

After students answered the instruments, data was analyzed and the results obtained are reported in Table 2. At the beginning of the year, the participants and non-participants scored similarly in their environmental attitudes and knowledge (see Figure 1).

Table 2. Mean environmental attitudes score for each gender in the different groups

	Gender	Mean
Participants	Girls	71,17
	Boys	74,28
Non-participants	Girls	62,08
	Boys	56,49

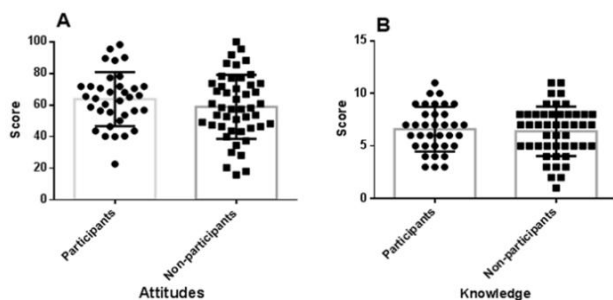


Figure 1. Comparison between participants and non-participants environmental attitudes and knowledge at the beginning of the environmental education program

The analysis indicated a significant interaction between the participation or not in the environmental program and the student's environmental attitudes [Figure 2, $F(1,80) = 33.716$; $p = 0.00001$] and on their environmental knowledge scores before and after the intervention [Figure 3, $F(1,74) = 5.0180$; $p = 0.0289$]. The participation in the environmental education program increased the scores of students, whereas those who did not participate had similar scores in the first and second evaluation.

To verify the influence of environmental knowledge on the students' environmental attitudes, linear regression was performed both in the first and second assessment of students' scores. As it is possible to observe in Figure 4, neither at the beginning nor end of the year, knowledge has a relationship with the environmental attitudes of this sample, rejecting the hypothesis 2.

When hypothesis 3 was tested, it was found that female and male students did not differ in their environmental attitudes, neither at beginning nor at the end of the year, in the evaluated students, independently of the participation in the environmental program ($F(1,74) = 2.0066$; $p = 0.16081$) or grade ($F(1,74) = 0.45677$; $p = 0.50124$). This result rejects hypothesis 3.

Finally, hypothesis 4 was tested to determine a possible difference between the older (9th grade) and younger (8th grade) students' environmental attitudes. The statistical analysis did not indicate differences between the two age groups of students, independently of participation in the

environmental education program ($F(1,74) = 0.05998$, $p = 0.80720$). This result rejects hypothesis 4.

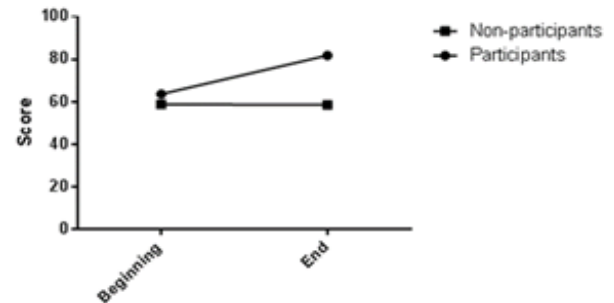


Figure 2. Environmental attitudes scores of students at the beginning and end of the year. Two way ANOVA (2 participant/non-participant x 2 sampling times) indicated a significant interaction between the two factors $F(1,80) = 33.716$; $p = 0.00001$

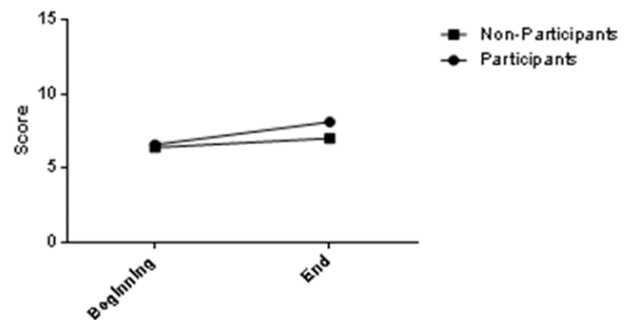


Figure 3. Environmental knowledge scores of students at the begin and end of the year. Two way ANOVA (2 participant/non-participant x 2 sampling times) indicated a significant interaction between the two $F(1,74) = 5.0180$; $p = 0.0289$

Table 3. Mean environmental attitudes score of each grade in the two different groups

	Grade	Mean
Participants	8 th grade	73,36
	9 th grade	69,88
Non-participants	8 th grade	61,20
	9 th grade	58,08

4. Discussion

The results obtained here indicated that the participation in the guided activity of the environmental education program improved the students' environmental attitudes and knowledge. These results are in accordance with the findings of several studies where the students' environmental attitudes increased after the participation in environmentally-friendly programs [36-38]. Taken together, we can hypothesize that the guided participation in activities in environmental education programs can positively influence the students' environmental attitudes and knowledge. Consequently, the use of this type of programs can be a tool to promote the pro-environmental attitudes and knowledge in elementary schools.

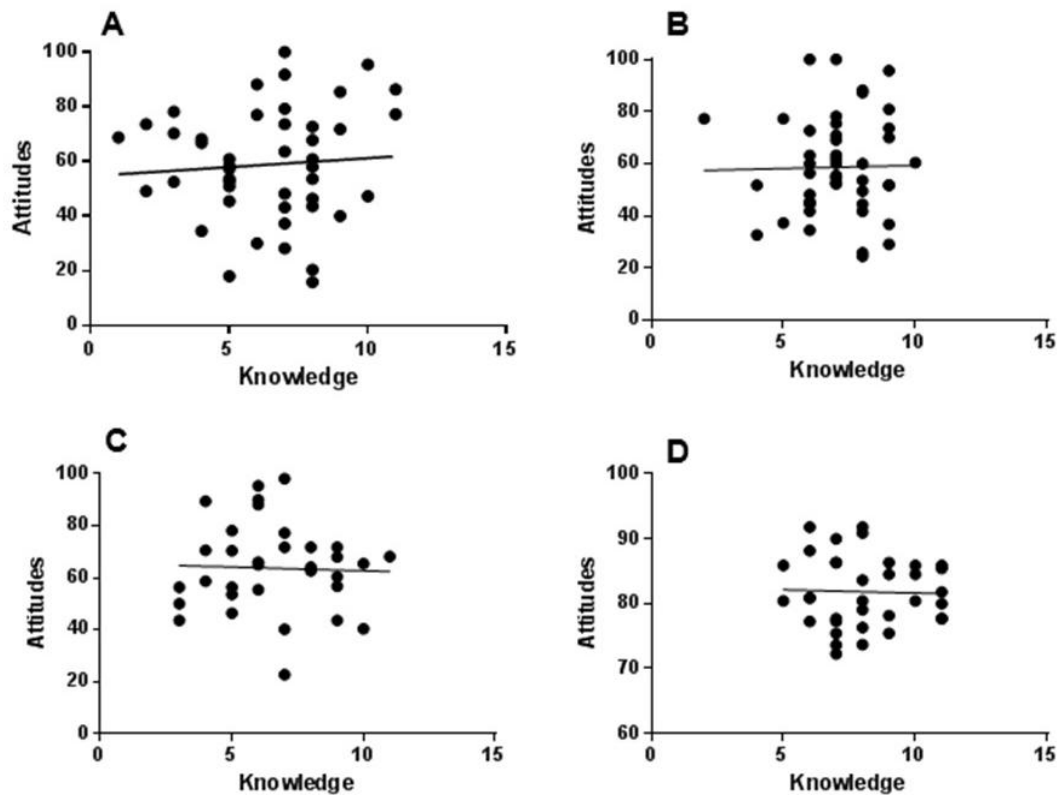


Figure 4. Linear regression between environmental attitudes and knowledge for A) non-participants students at the beginning of the year ($r^2 = 0.005825$; $p = 0.6101$), B) non-participants at the end ($r^2 = 0.0004017$; $p = 0.8936$), C) participants at the beginning ($r^2 = 0.001324$; $p = 0.8356$), and D) participants at the end of the year ($r^2 = 0.001151$; $p = 0.8466$)

It was expected a correlation between students environmental attitudes and knowledge. Although, despite environmental attitudes and knowledge had increased along the program, neither to participants students nor non-participants, knowledge influence their environmental attitudes. In general, knowledge seems to be correlated with environmental attitudes, as Lienfländer and Bogner [15] and Paço and Lavrador [39] reported in their studies. However, these patterns were not observed in our sample.

In addition, it was not found an influence of gender on the environmental attitudes of our sample. Grúňová *et al* [28] and Tucker and Izadpanhi [40] reported similar results. Others authors, for example, Walickzek, McFarland and Holmes [41] and Sahin and Erkal [42] reported differences between genders were girls showed more pro-environmental attitudes when compared with boys. Although, in our study, the participation in the environmental education program equally influenced boys and girls environmental attitudes. For Lienfländer and Bogner [30] when the activities of a program are equivalent between genders expectations, they would equally influence both girls and boys.

Finally, no differences were found between the school years, probably due the years are too close, only one year. However, even considering different stages of age showed not to be a factor on children's' environmental attitudes and knowledge, as it was reported by Tucker and Izadpanhi (2017).

5. Conclusions

Our study demonstrates that the individual's environmental attitudes and knowledge can be improved with the participation in an environmental education program. Environmental education appears to be an effective tool to change attitudes to promote pro-environmental behaviours forwarding to the sustainable development.

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