

**Avaliação das atitudes ambientais de uma amostra de estudantes brasileiros de
graduação**

Evaluation of environmental attitudes of a sample of Brazilian undergraduate students

**Evaluación de actitudes ambientales de una muestra de estudiantes brasileños de
pregrado**

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Resumo

As atitudes ambientais são importantes, uma vez que prevêm o comportamento ambiental e sua promoção pode ajudar a alcançar a sustentabilidade. Nosso objetivo foi avaliar as atitudes ambientais de 196 estudantes matriculados em cursos de graduação: biologia, química, língua portuguesa e pedagogia, de uma universidade brasileira. Os dados foram analisados utilizando análise de variância de três e quatro vias (ANOVA). Encontramos que estudantes de biologia são aqueles que apresentam atitudes mais pró-ambientais, enquanto estudantes de química são aqueles que têm atitudes pró-ambientais mais baixas. O gênero também pode ser um fator que influencia as atitudes, com a diferença entre os alunos do sexo masculino e feminino dependendo do curso. A influência do ano escolar também depende do curso. As disciplinas relacionadas ao meio ambiente no currículo influenciam as atitudes dos alunos. Assim, sugerimos que eles também sejam endereçados a outras áreas de estudo.

Palavras-chave: Atitudes pró-ambientais; Estudantes de graduação; Educação ambiental; Futuros professores; Atitudes sustentáveis.

Abstract

Environmental attitudes are important once they predict environmental behavior and its promotion could help to achieve sustainability. We aimed to evaluate the environmental attitudes of 196 students enrolled in undergraduate courses: biology, chemistry, Portuguese language, and pedagogy, from a Brazilian university. Data were analyzed with three- and four-way analysis of variance (ANOVA). We found that biology students are those that present more pro-environmental attitudes while chemistry students are those with lower pro-environmental attitudes. Gender can also be a factor influencing attitudes, with female and male students differently depending on the course. School year influence also depends on the course. The subjects related to the environment in the curriculum influence student's attitudes. Thus, we suggest that they should be addressed also to other study areas.

Keywords: Pro-environmental attitudes; Undergraduate students; Environmental education; Future teachers; Sustainable attitudes.

Resumen

Las actitudes ambientales son importantes una vez que predicen el comportamiento ambiental y su promoción podría ayudar a lograr la sostenibilidad. Nuestro objetivo fue evaluar las actitudes ambientales de 196 estudiantes matriculados en cursos de pregrado: biología, química, lengua portuguesa y pedagogía, de una universidad brasileña. Los datos se analizaron con análisis de varianza de tres y cuatro vías (ANOVA). Descubrimos que los estudiantes de biología son aquellos que presentan actitudes más proambientales, mientras que los estudiantes de química son aquellos con actitudes proambientales más bajas. El género también puede ser un factor que influye en las actitudes, con una diferencia entre estudiantes y varones según el curso. La influencia del año escolar también depende del curso. Las materias relacionadas con el medio ambiente en el plan de estudios influyen en las actitudes de los estudiantes. Por lo tanto, sugerimos que también deben dirigirse a otras áreas de estudio.

Palabras clave: Actitudes proambientales; Estudiantes de pregrado; Educación ambiental; Futuros profesores; Actitudes sostenibles.

1. Introdução

Over the last few years, the excessive exploratory and depredatory anthropogenic activities over the last few centuries in relation to the use of the natural resources, has recently raised a wave of awareness about the environmental preservation and protection (UNESCO–UNEP, 1991, Robinson & Brownlow, 2015; Paço & Lavrador, 2017). The main objective of the pro-environmental activities is to preserve the natural resources and promote the social development in which where the individual realizes how their activities impact the natural

environment. The foundations for social development towards the environment relies on sustainability (Schmitz, 2019a, 2019b). Sustainable development is understood as the social development in which the actual and future human needs are considered and was defined by the World Commission on Environment and Development (Brundtland, 1992). Therefore, in a sustainable society, individuals must be aware that, in a new future, society will need to continue using several natural resources as the primary source of its goods. Consequently, current resources should be exploited with conscious and in a balanced way, promoting the preservation of the environment and the natural resources for future generations.

Therefore, for the society to achieve sustainable development, it is needed that the human practices and actions concerning the use of the natural resources and the emission of waste be altered (Schmitz, 2019a, 2019b). New attitudes and concrete actions are highly needed, particularly because of the uncontrolled exploitation of nature by the mankind is the major factor contributing to the destruction of the environment (Schmitz, 2019a, 2019b; Kalsoom, 2018). Of particular concern, the environmental crisis can be directly linked with the behavioral patterns and the beliefs of the human population (Schmitz, 2019a, 2019b).

Considering the importance of environmental attitudes to the development of environmental behaviors, we aimed to evaluate the environmental attitudes of undergraduate pre-service teachers from a Brazilian public university.

2. Theoretical background

Considering the necessity of changes in the behavior and consumption patterns concerning the natural resources use, a set of diverse pedagogical practices was proposed in 1972 (UNESCO–UNEP, 1991). This set of pedagogical practices was related to the environmental subject and therefore it was called Environmental Education (Andrew & Robottom, 1998; Leff, 2000; Loureiro, 2008). One of the main objectives of Environmental Education encompasses the development of positive attitudes toward the environment (Stap et al., 1969; Kalsoom, 2018). These set of attitudes are important motivational factors, which are expected to create concerns about the problems associated with environmental deterioration and how to solve these problems (Stapp et al, 1969; Koc & Kuvac, 2016; Major et al., 2017; Kalsoom, 2018, Sivapalan & Speight, 2018).

Attitudes are judgments that an individual does about a given attitudinal object, which can be a person, a situation, information or an object (Coll et al., 2000; Zabala & Arnau, 2011). Attitudes are included in the triad of learning contents (Concepts, Procedures, and

Attitudes) (Coll et al, 2000; Zabala & Arnau, 2011) about the natural and not natural environment, the problems associated to it and its possible solutions. In the present study, the attitudinal object is the environment and the problems associated with it.

The individual attitudes can be externalized either verbally as an intention or concretely via a behavior toward the environment (Coll et al., 2000; Zabala & Arnau, 2011). A repertory of attitudes have three components, a Cognitive (that is related to the individual's knowledge in relation to the attitudinal object), an Affective (that is related to the individual's feelings and preferences in relation to the attitudinal object) and a Conative component (which the manifestations of actions and declarations of intent) (Coll et al., 2000; Zabala & Arnau, 2011). Is through the interaction between these three components that happens the development of the positive attitudes toward the environment.

The positive attitudes toward the environment are called pro-environmental attitudes. Stapp et al defined them in 1969 as a set of actions and values that renders the individual aware of the environmental crisis. The individual is transformed into an agent that promotes a sustainable lifestyle, searching for a balance between technological development and the health of the environment.

According to the assumptions of Ajzen and Fishbein (1980) in their "Theory of Reasoned Action", the attitudes are indirectly related to the behavior. Attitudes are considered the predictors of behavioral intentions, which are the predictors of behavioral externalization. Ajzen (2005, 1985) as the predisposition of an individual to engage himself in a particular behavior defines behavioral intentions. In the present study, we gave special emphasis to the pro-environmental behaviors, i.e., those committed to environmental preservation and conservation (Corral-Verdugo, 2000, Graham-Rowe, Jessop & Sparks, 2019).

In Brazil, the positive attitudes concerning the environment are integral part curricula of elementary schools as the National Common Curricular Base (BNCC, 2017), proposed by the Ministry of Education and Culture (MEC). Consequently, every Brazilian citizen should have access to pro-environmental attitudes in the school. The understanding of the importance of pro-environmental attitudes and behaviors is mandatory for every citizen. Accordingly, Oerke and Bogner (2010) have pointed out that teachers should support the development of positive environmental attitudes and behaviors.

In line with this, the studies about the development of positive attitudes toward the environment in children and adolescents have been increasing in the last years. For example, Schmitz and Rocha (2018) demonstrated that participation in an environmental education program had a positive impact on the preservation attitudes of secondary school students from

Brazil. Accordingly, several other studies have indicated that participation of students in environmental programs and curriculum can enhance the pro-environmental attitudes and behaviors of the young students as the performed by Shay-Margalit and Rubin (2016), Treagust et al. (2016); Tucker and Izadpanahi (2017); Jackson and Pang (2017); Liefländer and Bogner (2014); Liefländer and Bogner (2016).

In this way considering the relevance is given to the pro-environmental teaching in the school context, it is essential to identify the environmental attitudes of undergraduate students, particularly those of pre-service teachers of different disciplines (Saribas, Kocuk & Ertepinar, 2016). This is of particular importance, given their future role as educators. Furthermore, the identification of anti-environmental attitudes in pre-service teachers will allow the proposition of interventional programs to solve them during the pre-service formation period (Taskin-Ekici, Ekici & CokadaR, 2015).

Therefore, this study evaluated the environmental attitudes of undergraduate pre-service teacher students from Chemistry, Biology, Portuguese and Pedagogy courses. Specifically, we tested the following hypotheses:

- 1) Students of the Biology course present higher scores in behavioral intentions, indicating that these students present more pro-environmental attitudes when compared with the students of the other courses.
- 2) The feminine gender presents higher scores than the masculine gender in behavioral intentions, indicating that they have more pro-environmental attitudes when compared with the environmental attitudes of the males.
- 3) Students of the last year present higher scores than those enrolled at the beginning of the courses, indicating that their attitudes are more pro-environmental after doing the specific courses (i.e., the pre-service teacher courses are preparing professionals with pro-environmental attitudes).

3 Metodologia

The present study was performed following Babbie's (1999) definition of survey. This type of research is characterized by a qualitative approach. It is used when the research object is opinions, knowledge, attitudes, believes or plans of the subjects, collected via questionnaires or interviews standardized to all samples (BABBIE, 1999). Data were collected along the school year of 2016 and 2017, during the class time of the students, enrolled in a Brazilian public university, localized in the Rio Grande do Sul state.

Authorization for data collection was consented by the professor in the class and by the students after enlightened this study's objectives and the participation form.

3.1. Participants

To realize this study and to test the three hypotheses were selected 196 students of four undergraduate courses. The undergraduate courses evaluated were courses of Chemistry (QMC), Biology (BLG), Portuguese Language (LBR) and Pedagogy (PDG). It was selected students enrolled in the first (1) and last (2) years of study in the undergraduate course. In Table 1 are described the characteristics of this population.

Table 1: Gender distribution of the study participants. Year 1 refers to the first year and Year 2 refers to the last year of study in the undergraduate course. (%F) indicates the percentage of female and male (%M) that participated in the study.

COURSE	YEAR 1			YEAR 2		
	N	%F	%M	N	%F	%M
CHEMISTRY (QMC)	33	69,70	30,30	18	66,66	33,34
BIOLOGY (BLG)	26	73,07	26,93	20	80,00	20,00
PEDAGOGY (PDG)	30	83,33	16,66	24	100,00	0,00
PORTUGUESE LANGUAGE (LBR)	25	76,00	34,00	20	70,00	30,00
TOTAL	114	75,44	26,56	82	80,49	19,51

Source: The authors.

As can be observed in Table 1, the sample is composed majorly of female students and, in all the four undergraduate courses this patter is observed. Also, the majority of the participants are enrolled in the first year of the undergraduate course. The majority of the students are from the chemistry undergraduate course. The sample of the last year of the pedagogy undergraduate course is composed only by women because it has no male students

enrolled in the last semesters of the course when the data were collected.

3.2. Attitude measurement instrument

As attitudes are not directly observables (Kalsoom, 2018; Lewis, Granek & Nielsen-Pincus, 2019), so, indirect methods are necessary to measure the individual's environmental attitudes. In the point of view of the Theory of Reasoned Action, which assumes that pro-environmental attitudes are the predictors of the pro-environmental behavioral intentions (Ajzen & Fishbein, 1980), a way that possibility the measurement of the environmental attitudes of the individuals that compose this population. In this way, it is possible to estimate the individual's attitudes concerning the environment through their declarations of the intensity to act in a determined way, positively related to the environment.

The data collection was realized from a questionnaire containing items related to personal information, like age, gender, undergraduate course and Year in the course (last or first), besides eleven sentences that describe behaviors related to the pro-environmental behavioral intentions.

Respondents answered this questionnaire with a visual scale, whose variation starts in zero and ends in ten, where zero is the absolute absence of the behavioral intentions described in each sentence and ten is the absolute presence of the behavioral intentions. In this way, how much closer to ten is the individual's score in each sentence, more pro-environmental is the individual's attitude. The Cronbach α value of this questionnaire is equal to 0.9, having its internal consistency considered good.

In this measurement instrument, what characterizes the participant's attitudes is the average score considered. In this way, how much closer to ten is the average mean in all questionnaires, more pro-environmental is the individual's attitude.

3.3. Data Analysis

The Pedagogy course did not have male students enrolled in the last year of the course, two different repeated-measures ANOVA was performed. The first repeated-measures ANOVA was performed discounted (3 courses: chemistry/biology/Portuguese) x 2 (years: begin/end of the course) and 2 (genders) x 11 (affirmations, which were treated as dependent of the subject, i.e., repeated measures). The second analysis was performed only with the female students of all undergraduate courses (4 courses: pedagogy/chemistry/biology/Portuguese) x 2 (years: begin/end of the course) x 11 (affirmations, which were treated as repeated measures).

4. Results and discussions

Information about the distribution of participants is described in Table I. The sample was composed mostly of women (77.5%) in 4 courses studied the course of chemistry contributed with about 28% of all participants.

4.1. Results about the hypothesis 1 test

As indicated in Table 2 (between-subject effects), there was a significant main effect of the course and Biology course presented the highest scores in the behavioral intentions. This may indicate that biology students have more positive attitudes towards the environment than chemistry and Portuguese students (see Figure 1).

Table 2: Main results of repeated measures analysis of variance without considering the students of Pedagogy undergraduate course.

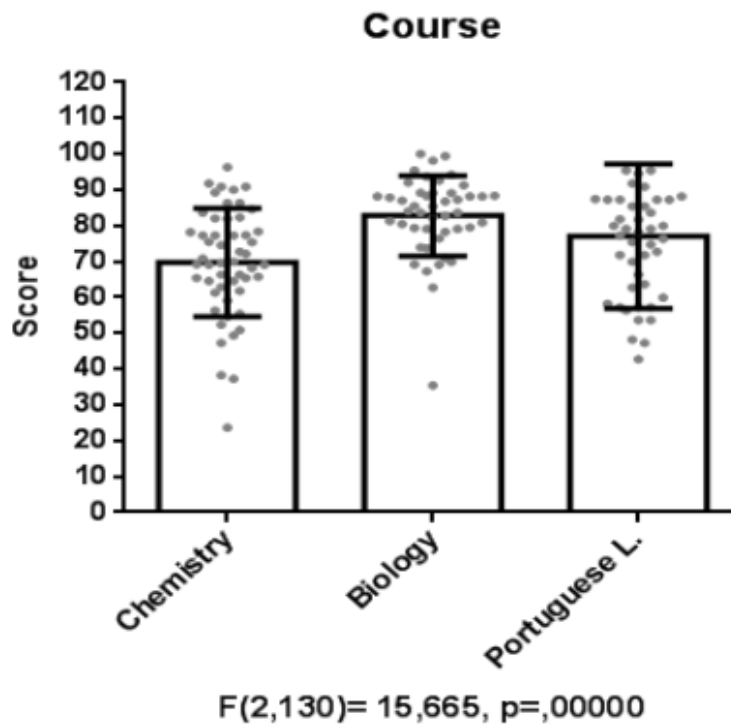
Repeated Measures Analysis of Variance					
Effect	SS	DF	MS	F	P
Gender	6724	1	6724	3,028	0,084188
Course	69558	2	34779	15,665	0,000002
Year	2191	1	2191	0,987	0,322312
Gender*Course	14073	2	7036	3,169	0,045302
Gender*Year	848	1	848	0,382	0,537567
Course*Year	68542	2	34271	15,436	0,000001
Gender*Course*Year	4911	2	2456	1,106	0,33395
Error	288629	130	2220		

Source: The authors.

As can be observed in Table 2, the statistical analysis showed a significant difference in the Course variable. Also, it was found an interaction between Gender and Course variables and between Course and Year variables. Those results are discussed in the following sections.

The course variable presented a statistical difference. Figure 1 is presenting the mean scores of three undergraduate courses: chemistry, biology, and the Portuguese language.

Figure 1: Result of the mean score of behavioral intentions differences found in the four-way ANOVA [(3 courses: chemistry/biology/Portuguese) x 2 (years: begin/end of the course) and 2 (genders) x 11 (affirmations, which were treated as dependent of the subject, i.e., repeated measures)].



Source: The authors.

Figure 1 showed that the biology undergraduate course presented the higher mean score for environmental attitudes when compared to Chemistry and Portuguese Language undergraduate courses. These results supported our initial hypothesis 1, i.e., the biology students have more pro-environmental attitudes when compared with students enrolled in the other 2 evaluated courses. To some extent, the results were expected because Biology students usually have stronger affective connections with the environmental subjects. The curricula of Biology has a much more direct relationship with the teaching subjects related to the natural environment and its ecological preservation. The awareness about the degradation of the environment and the empathy with the natural life can be one important factor underlying the high pro-environmental attitudes of biology students, when compared to the other courses, particularly, chemistry. Accordingly, Oerke and Bogner (2010) reported higher pro-environmental attitudes scores for training teachers in Biology than training teachers in the German Language. Additionally, Hodgkinson and Miccael Innes (2001) proposed that the

positive attitudes concerning the environment are important factors in the selection of the undergraduate course. They have indicated that students' attitudes vary depending on the studied subject, consequently, undergraduate courses which are more related to the environment (e.g. biology) tend to present more strong and coherent pro-environmental attitudes when compared with the students from other undergraduate courses. Other studies have indicated similar results (Pe'er, Goldman & Yavetz, 2007; Tikka, Kuitunem & Tynys, 2000).

Of note, the undergraduate Chemistry students had the lowest pro-environmental attitude scores. These results were somewhat unexpected" because the chemistry was expected to be directly related to the natural environment, particularly, with potential environmental degradation by chemical industrial pollution. Consequently, it seems imperative to discuss and change the curricula of Brazilian Undergraduate courses in chemistry in order to enhance the pro-environmental attitudes of chemistry undergraduate students.

The results obtained with Portuguese Language undergraduate students can be explained by the absence of environmental subjects in the formal curriculum of this course. Thus, as discussed for the chemistry course, the Portuguese language course has to include in the curriculum environmental issues. The inclusion of environmental subjects in the curricula is expected to increase the pro-environmental attitudes of the future teachers and, consequently, may have a positive impact on the attitudes of their future students in basic schools.

In the second analysis (where the male gender was not included) (See Table 3).

Table 3: Main results of repeated measures ANOVA, without considering the male students and included the Pedagogy undergraduate course students.

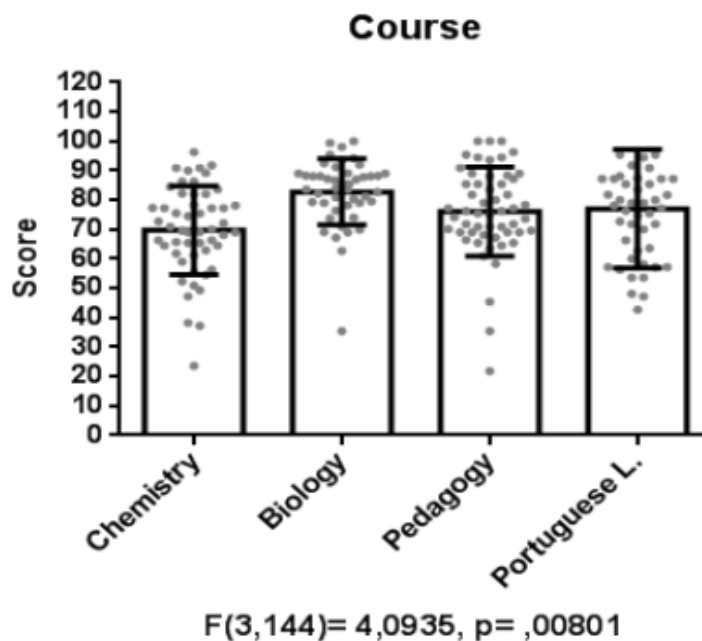
Repeated Measures Analysis of Variance					
Effect	SS	DF	MS	F	P
Course	25488	3	8496	4,094	0,008006
Year	1084	1	1084	0,522	0,471071
Course*Year	34975	3	11658	5,617	0,001139
Error	298873	144	2076		

Source: The authors.

Table 3 presents the results of the second statistical analysis. As it can be observed a statistical difference between courses and interaction between Course and Year variables. Those results are discussed below.

The female biology undergraduate students performed better than the female in the chemistry, pedagogy and Portuguese language course (Figure 2).

Figure 2: Result of the mean score of behavioral intentions differences found in the three-way ANOVA (4 courses: pedagogy/chemistry/biology/Portuguese) x 2 (years: begin/end of the course) x 11 (affirmations, which were treated as repeated measures).



Source: The authors.

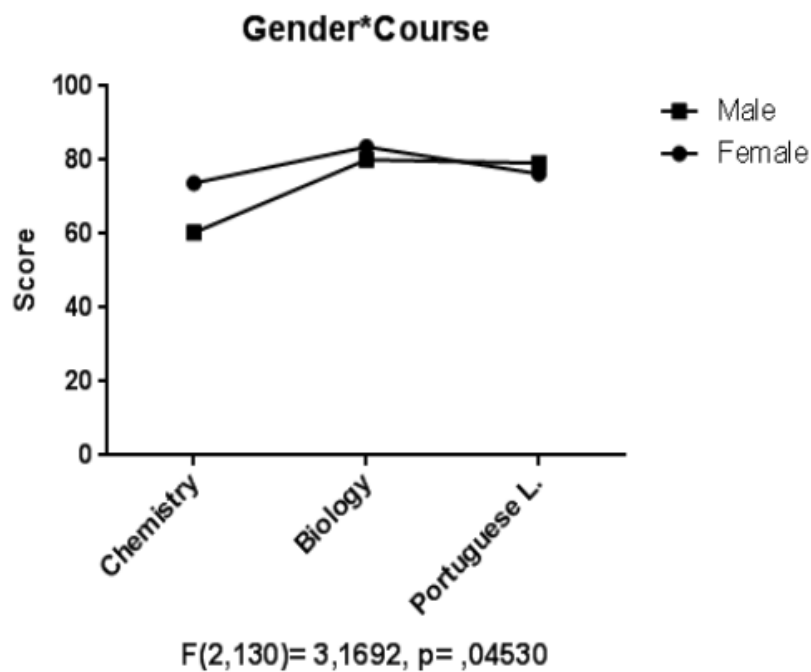
Figure 2 presents the mean scores of environmental attitudes for the four undergraduate courses. As we can observe, Pedagogy students showed similar scores to those of the Portuguese Language and chemistry students. Considering that the pedagogy students will be the future primary school teachers (i.e., they will teach the students with 6 to 11 years), it is essential to change the pedagogy curricula to improve the pro-environmental attitudes of the future primary teachers' students in Brazil.

4.2. Results about the Hypothesis 2 test

Hypothesis 2 concerns about differences in the environmental attitudes between

gender in favor of the woman. The first analysis did not indicate differences between the overall mean scores of genders. However, interactions of Gender*Course was found. Figure 3 presents these interactions.

Figure 3: Gender and Course interaction found in the four-way ANOVA [(3 courses: chemistry/biology/Portuguese) x 2 (years: begin/end of the course) and 2 (genders) x 11 (affirmations, which were treated as dependent of the subject, i.e., repeated measures).



Source: The authors.

In this figure (Figure 4), it can be observed that the woman students of the Biology course have higher scores in behavioral intentions and the Chemistry man students have the lowest mean score. This result also indicates a difference between the genders of the Chemistry course students. In this concern, the woman students present positives environmental attitudes when compared with the man students of this undergraduate course. This kind of sensibility is a result of how women's behaviors and opinions are shaped in accordance with the expectances of this gender in the social context in which they are inserted. Zelezny, Chua and Aldrich (2000) verified that, mostly, women present stronger and more positive environmental attitudes when compared with men, as a result of the different socialization process suffered by women and men, in which women are tended to be more empathetic and possess more “ethic of care” (Zelezny, Chua & Aldrich, 2000). Other authors

also found differences between gender, for example, Tikka, Kuitunem and Tynys (2000), Oerke and Bogner (2010) and Félonneau and Becker (2008). The scores of the students distributed by gender, by the school year and by the undergraduate course are presented in Table 4.

Table 4: Distribution of pro-environmental attitudes scores per school year (first and last), per gender (female and male) by undergraduate course.

		Scores of Pro-environmental attitudes			
		Chemistry	Biology	Pedagogy	Portuguese L.
First Year	Female	19752	17476	20770	14564
	Male	7480	5896	3563	6019
Last Year	Female	8662	16063,6	20872	13120
	Male	3151	3795	0	4440

Source: The authors.

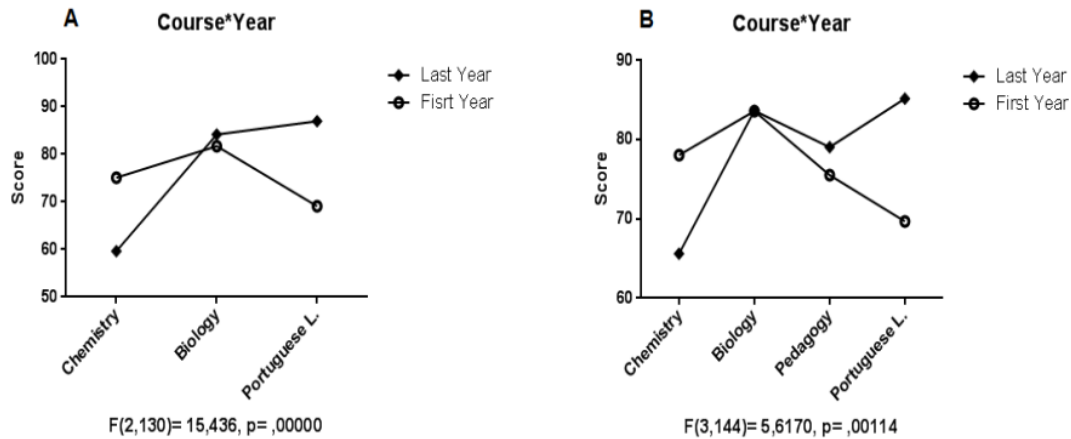
Table 4 shows the distribution of environmental attitudes scores of each course, school year and gender. We call the attention that, in general, female students show a tendency to have more pro-environmental attitudes than male students, independently of the school year. Besides that, students of Biology and Portuguese Language do not vary their attitudes concerning their gender. This result partially supports Hypothesis 2.

4.3. Results about the Hypothesis 3 test

The hypothesis three tested in this study is based on the assumption that students who are longer on the undergraduate course present more positive and stronger attitudes toward the environment in comparison with the students who are less time enrolled in the undergraduate course. Neither the first nor the second statistical analysis found a significant difference in the average score of the first-year students *versus* last year students. However, both analyses found an interaction of Course*Year. Figure 4-A shows the interaction found in the first analysis.

Figure 4: Interactions Course*Year found in the A) four-way ANOVA [(3 courses: chemistry/biology/Portuguese) x 2 (years: begin/end of the course) and 2 (genders) x 11

(affirmations, which were treated as dependent of the subject, i.e., repeated measures)] and B) three-way ANOVA [(4 courses: pedagogy/chemistry/biology/Portuguese) x 2 (years: begin/end of the course) x 11 (affirmations, which were treated as repeated measures)].



Source: The authors.

It is possible to observe that the students enrolled in the first year of the Biology Class scored higher in comparison with the students of the same year enrolled in the other courses. On the other hand, the student's enrolled in the last year of the Chemistry course presented the lowest scores. This figure is shown that, for students enrolled in Biology and Portuguese Language courses, last year students scored higher than the first-year students, suggesting that their environmental attitudes become more positive along the undergraduate years. However, for the Chemistry students, an opposite pattern was observed. The students of the last year of undergraduate scored lower than the students of the first year. This result suggests that the students of chemistry course become less pro-environmental along the undergraduate years.

The results of the performed statistical analysis discounting the male participants are showed in Figure 4-B. As can be observed, Biology students of the first year showed more positive attitudes and the students of the last year of the Chemistry course showed less positive attitudes toward the environment. Although, students of Biology of the first and last year have a similar pro-environmental attitude. Students of Pedagogy and Portuguese Language enrolled in the last year of the course are more pro-environmental than first-year students. Concerning the Chemistry students, the same pattern was observed. Students of the first year are more pro-environmental than last year's students.

5. Final considerations

Our results show that biology undergraduate students are those with more pro-environmental attitudes comparing with students from other areas of study, once they have more environment-oriented subjects in their curriculum. Thus, environment-oriented subjects should be addressed to the other undergraduate courses, once sustainable development is a world-wide concept and it will be achieved with the contribution of all people and communities. With this in mind, to promote pro-environmental attitudes in future teachers is very important, considering that they will be responsible to teach those attitudes, as expected with the Environmental Education policies. Finally, environmental attitudes seem to be influenced by the undergraduate course choice. Gender and school year influences on environmental attitudes are also dependent on the undergraduate course. For future researches we suggest a deep analysis of the undergraduate courses curricula and also, were perceived low pro-environmental attitudes, to implement tools to improve those attitudes, for example, environmental education programmes and practices.

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