

ENVIRONMENTAL CONSERVATION AND THE CERRADO BIOME: INVESTIGATING KNOWLEDGE AND ATTITUDES OF BAURU RESIDENTS

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Abstract

In today's context of environmental degradation, environmental issues have increasingly become a focus of global discussion. Although many researchers emphasize the importance of knowledge and information in promoting environmental protection, research involving people's notions about and attitudes toward the environment and establishing their connection with such knowledge is scarce. This lack of research led to the following inquiry: Is it possible to relate conservation actions and concern about a biome – in this case, the Cerrado – to the population's level of knowledge about the environment in which they live? This research presents results from an investigation conducted in a representative population sample in Bauru, where there are fragments of a Cerrado Legal Reserve. The sampling approach used was probabilistic; it is based on random laws and can be submitted to statistical methods. The total sample (450 people) was divided into 90 people per Bauru region, 45 people female and 45 males. Each gender group was divided into three age groups: the first from 16 to 30 years, the second from 31 to 55 years and the third above 56 years. Through the questionnaire, we collected the following data from respondents: personal data such as salary, gender, age, level of education, notions/actions and intentions related to environmental conservation and general knowledge about the Cerrado. The result of the chi-square analysis is consistent with this finding, as it is less than 0.05, demonstrating a significant association between these two variables.

Key words: *environmental epistemology, questionnaire, probability sample, garbage disposal, conservation.*

Introduction

In today's context of environmental degradation, environmental issues have increasingly become a focus of global discussion. Extensive citizen and government-led movements have argued that we need to face environment degradation. Similarly, organizations, educational programs and campaigns are working to awaken humanity to the current environmental crisis, the consequences of which may become irreversible and lead to the destruction of all living beings.

Human overconsumption, greed and irresponsibility have led to the endangerment of numerous species, the aridification of fertile and productive fields and the pollution of rivers and lakes. In the pursuit of wealth and comfort, humans end up harming nature in many ways, without considering the catastrophic effects of their unreasonable actions. The importance of the environment in areas of economics, politics, health and education cannot be denied, and, conservation is becoming increasingly analyzed and discussed as part of a stronger focus on environmental protection.

Despite the broadening awareness of these issues and the increasing emphasis on the

importance of informing people about how degraded their environment is, research concerning people's knowledge about their environment as the basis for such concern is scarce. This observation is paradoxical in light of the emphasis researchers put on the importance of knowledge in responding effectively to current environmental issues.

Miller (2007) notes that the main causes of environmental problems are population growth, the waste of resources, poverty, a lack of appreciation of the Earth's natural capital and ignorance about planetary functions. To him, scientific knowledge about how the planet operates and is maintained is the key to learning how to live more sustainably.

Ricklefs (2003) also emphasizes the necessity of knowledge by claiming that an ecological understanding alone will not solve all aspects of our environmental problems, whether political, economic or social; however, as the necessity of managing natural global systems increases, success will depend on our understanding (which itself depends on principles of ecological knowledge) of their structure and operation.

Similarly, Begon, Townsend & Harper (2007) report that soil and water have been polluted, several natural environments have been destroyed, natural resources have been overexploited and species have been transported around the world, which has negative consequences for native ecosystems and puts many species at risk of extinction. In their view, understanding the extent of the problems that we face and the means that we have to address these problems depends completely on the correct understanding of ecological functions.

In addition, Enrique Leff (2007) states that the environmental crisis is a crisis of reason, as environmental problems are fundamentally knowledge problems. Given this perspective, there are implications for all environmental policies, which must pass through the political process, and for education.

Although many researchers emphasize the importance of knowledge and information in promoting environmental protection, research involving people's notions about and attitudes toward the environment and establishing their connection with such knowledge is scarce.

The problem, as briefly discussed in the previous paragraphs, led to the following research questions: Do people know the environment where they live? If so, does this knowledge affect their attitudes and thoughts about environmental conservation?

Diniz, Filho, Machado & Cavalcanti (2010) note that the conservation of biological diversity is one of the biggest challenges for society today. This is because the natural habitats that have evolved over millennia can be eliminated because of ecosystem fragmentation, exotic species introduction, overexploitation of vulnerable populations and climate change. The Brazilian Cerrado, one of the largest biomes in Brazil, faces all of these threats and, since 2000, has been identified as a global conservation priority.

Therefore, the need for initiatives that preserve the remaining areas of the Cerrado is clear. Mariscal et al. (2006) argue that an initial tool to facilitate such initiatives is the revitalization of cultural and environmental values in this region. Palhaci (2009) emphasizes that the sensitization and involvement of residents in their surrounding environment are essential to ensuring that they respect and care for the environment and, consequently, understand and carry out effective conservation measures.

For these reasons, our research, based on the principles of the above-cited authors, who articulate the importance of knowledge in conservation, investigated the knowledge that the Bauru population who live near fragmented areas of the Cerrado have about the environment in which they live and whether that knowledge influences their notions of and intended actions related to environmental conservation.

Methodology of Research

To perform the proposed research, it was necessary a quantitative methodology that allowed to use the chosen sample as representative of the Bauru population. Under such an approach, the sample is a portion that represents the whole and must possess the same characteristics of the whole. Studying only a sample and not the whole population can result in a certain level of error, which can be calculated by accounting for all of the population parameters (Santos, 2009).

A questionnaire was applied to an urban population sample to collect data about environmental conservation notions/intentions/actions and about the respondents' knowledge of the Cerrado biome. After the questionnaire application, a statistical evaluation of the data was conducted to examine the relationship between stated knowledge and the conservation notions/intentions/actions declared.

Research Location

The city of Bauru is located in the St. Paul Federal Unit and has a longitude between meridians 48 and 50 west of Greenwich and a latitude between parallels 21, 30 and 23 south of the Equator and an average altitude of 526 m (Weather Research Institute - Bauru Campus). The city has a territorial area of 667.681 km² and in 2010, the census reported a population of 343,937 inhabitants and a population density of 515.12 inhabitants/km² (IBGE - Geography and Statistics Brazilian Institute).

In Bauru, the Cerrado exists mainly in the southeast city center, and there are remnants of Cerrado vegetation preserved in contiguous areas that total approximately 836,0826 ha in the UNESP Campus Legal Reserve, in the Botanical Garden Municipal Reserve and in the Dr. Eneas Carvalho de Aguiar Benevolent Society Forest Reserve (Cavassan, Caldeira, Weiser, & Brando, 2009). The area that belongs to the Campus of the UNESP in Bauru has its starting point at the fence on the left side of State Highway Jau-Ípauçu (Route Commander João Ribeiro de Barros - SP 225), close to the coordinates 22 ° 20' S and 49 ° 00' W, at 580 m altitude, in the southeastern part of the city next to the urban perimeter.

Data Collection

The sampling approach used was probabilistic; it is based on random laws and can be submitted to statistical methods. The approach used also allows for compensating for errors and determining relevance and significance. Similarly, it provides everyone in the study population, i.e., Bauru, with the opportunity to be included in the sample (Santos, 2009). Selection was performed by area, and for this purpose, we used a cartographic map with the regional boundaries of Bauru. Data collection was performed in two phases: first, to obtain data from representative individuals of Bauru, the city was divided into five main sectors or regions (south/central, east, west, north and northwest); second, subareas inside these regions were selected to interview people equally from poor, middle-income and high-income neighborhoods.

The factors used to determine the sample size were as follows: the universe amplitude was infinite because Bauru has approximately 343,937 inhabitants; the desired confidence level was a standard deviation of 95.5%; the maximum allowable error was ± 5 , and the percentage in which the phenomenon occurs was 50%. Figure 1 shows the factors used in the formula for calculating the sample in an infinite population.

$$\eta = \frac{\sigma^2 \cdot p \cdot q}{e^2}$$

$$\eta = \frac{2^2 \cdot 50 \cdot 50}{25^2} = 450$$

Figure 1: Formula for infinite population sample calculation (Universe over 100.000 people) Legend: h = sample size, σ^2 = confidence level (number of standard deviations), p = percentage by which the phenomenon occurs, q = additional percentage, e = maximum error allowed (Gil, 1991).

The total sample (450 people) was divided into 90 people per Bauru region, 45 people female and 45 males. Each gender group was divided into three age groups: the first from 16 to 30 years, the second from 31 to 55 years and the third above 56 years.

Questionnaire Given to Residents

The questions were divided into three categories, according to Santos (2009), as follows: 1. Open questions – the individuals respond freely using their own words; 2. Closed questions – the questions may be multiple-choice (several possible answers for the question) or evaluation questions (the person gives a judgment based on a scale of intensity); 3. Linked questions - the questions are ordered so that one is subordinate to the other and the negative or affirmative answer to the first question requires or excludes the subsequent question.

In terms of objectives, the questions are classified according to Santos (2009) as follows: 1. Fact questions, which refer to objective data such as age, gender, occupation, civil status and religion, are used to characterize respondents and are at the end of the questionnaire; 2. Action questions, which in this case refer to the respondents' attitudes related to environmental conservation; 3. Intention questions, which intend to evaluate the individuals' intentions and, in this research, serve as checks to determine whether respondents would use a trail in the Cerrado region; 4. Opinion questions, which try to find out the respondents' opinions and, in this research, are related to environmental knowledge about the Cerrado region in Bauru.

Data Analysis

Through the questionnaire, the following data were collected from respondents: personal data such as salary, gender, age, level of education, notions/actions and intentions related to environmental conservation and general knowledge about the Cerrado. Each respondent received a score/grade of notions/actions/intentions declared about environmental conservation and a score/grade of general knowledge about the Cerrado.

The individual score representing the concepts and declared intentions for environmental conservation was calculated by adding conservation issue scores on questions such as the following: Environmental preservation is the responsibility of whom? What is the destination of your household waste and rubbish? How often do you wash your sidewalk or car, save energy, throw used oil in the sink, take longer than 15-minute showers, separate recyclables, use

biodegradable cleaning products, throw trash on the street? How do you dispose of branches from urban pruning, leftover medications, bulbs and batteries? Do you consider yourself very, little or not-at-all concerned with environmental preservation? When you eat something on the street, what packaging is used? What do you do when you see someone destroying or polluting the environment?

To assign values to the answers, the criteria used was obtained in the Section Laws of the Bauru City Hall from the City Health Code provision on collecting household garbage and the provision for the disposal of used batteries and light bulbs. If the interviewee's answer met the legal requirement, we scored the answer as positive; otherwise, we scored the response as negative.

Questions related to knowledge about the Cerrado included the following: description of the biome (climate, soil, vegetation, relationship with fire or other factors) and naming a plant, a fruit and an animal found in the Cerrado. To better understand the open questions data, the answers were divided into categories and scored them in the appropriate category. The following categories were developed: above-average consistent responses, consistent well-characterized responses, consistent poorly characterized responses, partially consistent responses and inconsistent responses. A score of zero was given to respondents' answers when they did not answer the question or when their response was considered inconsistent, and the score was highest when their responses were considered consistently above average. For the classification of responses in the categories elaborated, we used approaches of the following researchers: Coutinho (1978 and 2000), Cavassan (2002, 2006 and 2009), Durigan et al. (2004), Diniz et al. (2010).

Respondent Scores and Their Relations

Numerical grades, based on the scoring methodology explained above, were used to relate the general knowledge about the Cerrado with the declared notions, actions and intentions of conservation. We also related the notions, actions and intentions of environmental conservation with the respondents' education levels. The response data and notes relating to conservation notions and attitudes were registered into Minitab 11. Minitab program was used to compute numerical percentages and chi-square coefficients in order to analyze the data. In relations with a chi-square ' $p \leq 0.05$ ', the variables were considered significantly correlated.

Results of Research

When respondents were questioned about the frequency of hearing about conservation issues, revealed that the most cited issues in their daily lives were those related to the environment, environmental preservation, environmental pollution, recycling, deforestation, fires and climate change. The least cited issues were the appearance of new species, the Cerrado biome, sustainable development and biodiversity. The percentages of these data are listed in Table 1.

Table 2 shows the percentage of respondents' activities related to environmental conservation. These results show that the daily frequency with which people perform activities of environmental conservation, such as saving energy, separating recyclables and using biodegradable cleaning products, is high. However, the frequency of daily activities such as washing sidewalks and cars and littering is considerably lower, and none of the respondents said that they wash their car every day.

Table 1. Frequency of respondents' answers related to environmental conservation issues (%).

	Every day	Once a week	Every 15 days	Once a month or rarely	Never
Fires					
Environmental pollution	34.22	34.67	13.33	14.45	3.33
Animal and plant extinctions	54.00	26	7.78	6.22	6
Deforestation	19.78	26.45	16.44	26.22	11.11
Oil spilling	39.11	28.22	17.33	11.34	4
Climate changes - Global warming	26.89	24.67	13.33	27.33	7.78
Environmental conservation	30.89	28	18.22	12.44	10.45
Recycling	57.11	23.33	7.56	7.33	4.67
Cerrado	42.22	27.11	12.67	14.89	3.11
Environment	5.78	8.22	9.33	38.67	38
Rise of new species	62.00	20.89	5.11	7.78	4.22
Sustainable development	2.89	3.33	4.89	40.89	48.00
Biodiversity	11.78	17.33	18.44	30.67	21.78
Biofuels	13.56	20.44	17.56	25.56	22.88
	14.44	27.11	16	25.56	16.89

Table 2. Frequency of respondents' and their families' activities related to environmental conservation (%).

	Every day	Once a week	Every 15 days	Once a month or rarely	Never	Do not know
Wash sidewalks	3.33	32	15.56	18.88	26.67	3,56
Wash cars	0	11.78	20.89	37.56	27.56	2.22
Pour used oil down the sink	4.89	3.78	2.22	5.34	76.44	7.33
Take more than 15 minutes in the shower	30.67	12.67	2.22	8.22	42.00	4.22
Litter	1.78	0.22	0.67	4.00	89.33	4
Save energy	80.22	2.44	2.44	3.56	5.34	6
Recycle	65.33	9.11	1.11	3.56	18.00	2.89
Use biodegradable cleaning products	50.22	6.44	4.00	4.22	10.45	24.67

Urban tree disposal results are shown in Table 3. It is emphasized that the number of people who said that they call the Department of the Environment for disposal (164) is almost equal to the number of people who burn the branches or throw the twigs in the trash or empty lots (188). This result was not expected, but it indicates that most people who have this type of garbage are concerned with disposing of it in an appropriate place. Disposal of this material into dumpsters and landfills is controversial because some people reported that garbage pickers

charge to collect branches from homes and then discard them on the ground nearby, and dumpsters are designed for disposing of construction debris.

Table 3. Percentage of urban tree disposal methods.

Urban tree disposal methods	Numbers of respondents	Percentage (%)
Municipal Department of Environment	164	36.44
Regular garbage/trash	91	20.22
Thrown into rivers or empty lots	84	18.67
Does not have or does not know	58	12.89
Dumpster/Garbage pickers	33	7.33
Burnt	13	2.89
Other	7	1.56

Most respondents throw leftover medication in the trash or down the sink, and the proportion of people who properly dispose of this type of material is still relatively low. There may be a lack of public service announcements indicating how to dispose of leftover drugs and medications. The results can be seen in Table 4.

Table 4. Percentage of leftover medication disposal methods.

Medication disposal methods	Numbers of respondents	Percentage (%)
Regular garbage/Trash	277	61.55
Municipal Department of Environment or collection point or health services point	73	16.22
Does not remain or don't use	23	5.11
Sanitary toilet or sink	21	4.67
Donation	21	4.67
Don't know	12	2.67
Recyclable	10	2.22
Save/Kept	8	1.78
Thrown into rivers or empty lots	3	0.67

Most people do not properly dispose of light bulbs, and only 126 of the respondents said that they call the Municipal Department of the Environment or take these materials to specific collection points. Some people complained to the researcher that they did not know how to dispose of light bulbs and, therefore, kept them. Therefore, we emphasize that there is a lack of guidance to Bauru citizens on how to properly dispose of such material. It is noteworthy that many people throw used light bulbs in the trash because of the lack of information explaining how they should properly dispose of them. These results are shown in Table 5.

Table 5. Percentage of bulb disposal methods.

Bulb disposal methods	Numbers of respondents	Percentage (%)
Regular garbage/Trash	263	58.44
Municipal Department of Environment or collection point	126	28
Recyclable	28	6.22
Don't know	12	2.67
Save/Kept – Don't have – Don't use	9	2
Other	7	1.56
Garbage pickers	3	0.67
Thrown into rivers or empty lots	2	0.44

A slightly greater proportion of the interviewed population takes batteries to the Municipal Department of the Environment or to specified collection locations compared with disposal of other material. Therefore, fewer people throw this type of material in the trash. It is inferred that more people discard this material correctly due to the many local disposal collection points at supermarkets, pharmacies and other locations. However, a portion of the population still throws batteries in the trash, which is the incorrect way to dispose of these materials. The percentages of these responses are shown in Table 6.

Table 6. Percentage of battery disposal methods.

Battery disposal methods	Numbers of respondents	Percentage (%)
Municipal Department of Environment or collection point	202	44.89
Regular garbage/trash	194	43.11
Don't know	20	4.45
Recyclable	18	4
Don't use	9	2
Other	5	1.11
Kept/Save	2	0.44

In previous questions, is possible to observe the lack of knowledge among the population about environmental conservation. There are people who know that it is incorrect to discard certain items in the trash, but because of the lack of guidance, they end up behaving this way. For people who do not know that is wrong to dispose of these materials in the trash, we emphasize the importance of knowledge of the implications of environmental pollution caused by the incorrect disposal of this material.

Despite the fact that the majority of respondents declared themselves to be very concerned with environmental preservation, the result is much less than expected, as this concern should be global and, as indicated by Leff, the quality of the environment is closely linked to their quality of life. Many people are affected by diseases, many of which are caused by human pollution and contamination of the environment, but cannot understand how improvement of

their environmental conditions will also improve their quality of life. This is explained again by the lack of knowledge about the environment and its relationship with human populations. The results of these responses are shown in Figure 2.

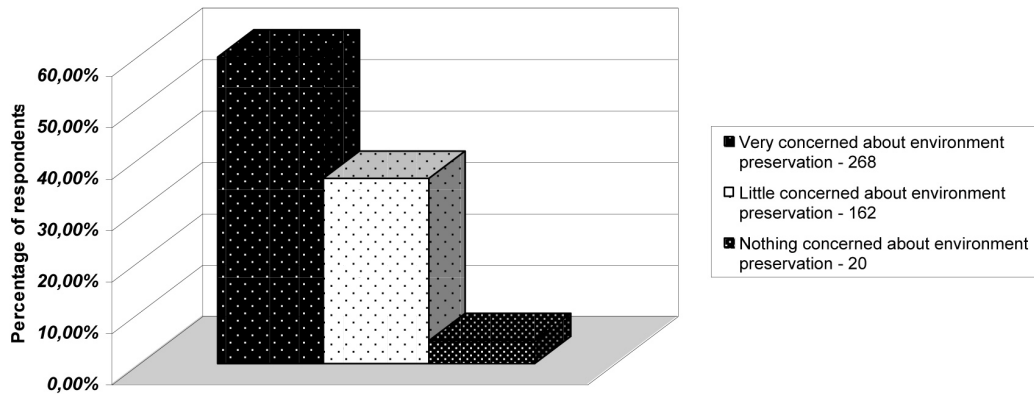


Figure 2: Percentage of environmental preservation concern levels.

There is a great difference between people who consider the Cerrado biome around Bauru to have high biodiversity and those who consider it to have low biodiversity. However, a significant number of these people did not know about the biodiversity of this biome. Again, it is emphasized the lack of knowledge existing among most of the population about an environment that is located in their area. The results are found in Figure 3.

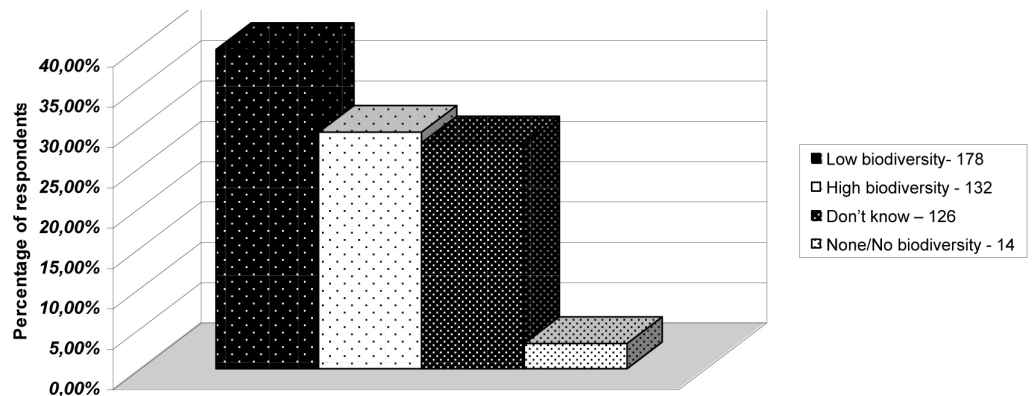


Figure 3: Percentage of respondents' knowledge of Cerrado's biodiversity.

Less than half of the respondents described the characteristics of the Cerrado biome's climate, soil, vegetation, fauna and fire regime. The same response rate was found when we asked about plants and fruits found in the Cerrado. The following plants were mentioned by the respondents at least four times: angico, cinzeiro, ipe, jatoba, leiteiro and orchid. Among the fruit found only in the Cerrado, the following were mentioned: the Cerrado pineapple, ananas, carobinha, gabioba (this was mentioned 59 times), goiabinha, marmelo, marolo, pequi (this was cited 31 times) and pitanga. Among the fruits that are found in the Cerrado and other environments, the following were cited: cashew (mentioned six times), guava (cited 11 times) and ingá (cited five times).

The number of people who did not responded to questions about animals found in the Cerrado was lower than the number of people who did not responded to previous questions;

more than half of respondents cited an animal or group of animals. Among the animals most frequently cited were armadillo (52 citations), deer (40 citations), maned wolf (32 citations), capybara (32 citations), onça (30 citations), anteater (22 citations), snake (18 citations), opossum (14 citations), lizard (14 citations), jaguatirica (12 citations) and tapir (12 citations).

It also were asked about the visual aspects of the cerrado, and most respondents stated that they consider the environment to be visually beautiful, as shown in Figure 4. This result contradicts the stereotypical view of this biome as 'ugly'. Some respondents commented to the interviewer that every natural environment is beautiful; others commented that they considered the Cerrado ugly due to its gloomy appearance.

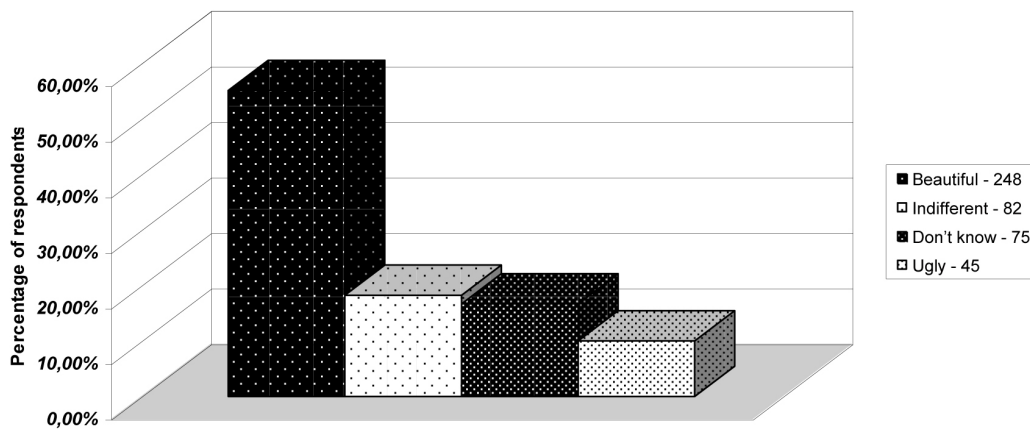


Figure 4: Percentage of respondents' characterization of Cerrado's visual traits.

Given this result, it is emphasized the importance of forming views and values related to the surrounding environment during childhood; we highlight, again, the lack of knowledge of most of the population, who did not know how to characterize this environment, even while living in a region where the Cerrado is significant.

A majority of respondents had never been on a trail in the Cerrado region; however, only a minority stated that they would not be willing to, as shown in Figure 5. Among the most-cited areas by Bauru locals were the Botanical Gardens, the Zoo and the campus of UNESP were the most cited.

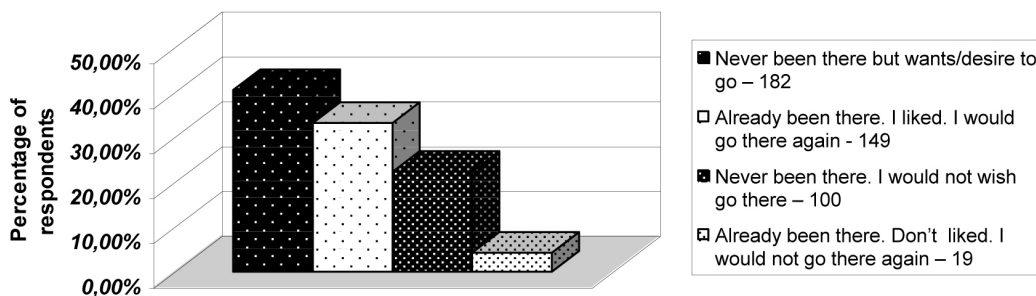


Figure 5: Percentage of respondents intending to hike in the Cerrado region.

Respondents reported that they want more knowledge about this environment through the following means: videos, readings, lectures and trails. Other forms, such as television, radio, computer games and the internet, were also cited.

The results of questions related to the relationship between environmental conservation notions, actions and intentions; knowledge about the Cerrado; and education are given in Table 7 and Table 8.

Table 7. Relation between Cerrado knowledge and conservation scores.

Rows: Cerrado scores		Conservation scores			
Columns: Conservation scores		High	Low	Middle	Total
Cerrado scores	High	11	09	14	34
		32.35	26.47	41.18	100.00
	Low	48	113	94	255
		18.82	44.31	36.86	100.00
	Middle	47	38	76	161
		29.19	23.60	47.20	100.00
Cell contents	Pearson chi-square= 21.055;				
Count	DF (Freedom Degrees) = 4;				
% of Row	p-value= 0.000				

Table 8. Relation between education level and conservation scores.

Rows: Education level scores		Scores of notions and intentions of environmental conservation actions			
Columns: Conservation scores		High	Low	Middle	Total
Education	Illiterate	4	9	8	21
		19.05	42.86	38.10	100.00
	Primary or elementary	13	51	37	101
		12.87	50.50	36.63	100.00
	High school	50	68	84	202
		24.75	33.66	41.58	100.00
	College	39	32	55	126
		30.95	25.40	43.65	100.00
Cell contents	Pearson chi-square= 19.387;				
Count	DF (Freedom Degrees) = 6;				
% of Row	p-value= 0.004				

It can be seen that among the people (34) with higher levels of knowledge related to the Cerrado, the number of individuals with high scores in conservation notions and intentions of action are higher (32.35%) than the individuals with low scores of conservation notions and intentions of action (26.47%). In contrast, among people (255) with lower knowledge scores related to the Cerrado, the number of individuals with high scores of conservation notions and intentions of action (18.82%) was lower than the number of individuals with low scores of con-

servation notions and intentions of action (44.31%).

Among illiterate people or those with at most a primary education, the percentages of subjects with low scores are higher (42.86% and 50.50%, respectively) than the percentages of people with high scores (19.05% and 12.87%, respectively). In people with a high school education, we perceived that the percentage of individuals with low scores is higher (33.66%) than the percentage of people with high scores (24.75%). However, this difference is smaller than that found in people with up to a maximum of an elementary education. Among those with a higher education, we noticed that the percentage of individuals with low scores is lower (25.40%) than the percentage of people with high scores (30.95%).

Therefore, it is noted that as the education level increases, the number of people with high scores in notions, actions and intentions of environmental conservation also increases. The result of the chi-square analysis is consistent with this finding, as it is less than 0.05, demonstrating a significant association between these two variables.

Discussions and Conclusion

The initial motivation of this research was to investigate whether people know about the environment they live in and whether that knowledge influences their environmental conservation notions and intentions for action.

The data show that most of the issues related to environmental conservation are part of the day-to-day life of the inhabitants of Bauru, although there are a significant number of people who have never heard the topic 'sustainable development', despite the fact that this topic is much discussed in the mass media today. Also important is that there were a number of people who had never heard about the Cerrado, despite it being their surrounding environment, which we had expected would have made the Cerrado more present in the daily lives of Bauru residents.

Regarding the daily activities related to environmental conservation, is worth noting that that activities such as saving energy, separating recyclables and using biodegradable cleaning products are, respectively, the three most cited as performed daily, which shows a possible positive result of advertisements aimed at the conservation of natural resources. However, we highlight as negative the fact that 18% of the residents interviewed have never separated recyclable material. If we extrapolate that number to the entire city population, many people fail to separate this type of material, which is very important to environment conservation.

The data about the disposal of light bulbs and leftover medicine show that a minority of the population brings these items to a designated collection point. Among the reasons for these attitudes may be the lack of accessible information indicating how people should dispose of this material, as in some cases, people are aware of the damage of disposing of this type of material in the trash but do not know the correct way to proceed.

With regard to the disposal of batteries, we believe that despite the small difference between the number of people who seek collection points for this type of material (44.89%) and the number of people throwing it in the trash (43.11%), the proportion of individuals who are concerned about disposing of it in the right way is higher than for the previous questions. It is inferred that this occurs because there are many collection points for this type of trash, such as pharmacies and supermarkets, among other locations. However, much of the population throws batteries in the regular trash, which is extremely detrimental to conservation due to the toxicity of these types of materials.

With regard to the questions regarding the degree of concern for environmental preservation, is alarming the number of people who declared themselves 'only a little worried', when as-

suming that only people concerned with preserving the environment will take steps to take care of it. It is highlighted here the need for a greater appreciation of the environment by residents to foster concern and respect for one's actions and their consequences.

With respect to knowledge about the Cerrado, 28% of respondents said they did not know about the biodiversity of this biome. Given such rich biodiversity, the lack of knowledge and appreciation by much of population about this rich biome shows the lack of values formation by the residents, which is an extremely important factor for building a respectful relationship with the surrounding environment and to extending this respect to other creatures and natural resources.

Only a small number of the responses related to knowledge of the Cerrado were considered unacceptable. Most respondents could not refer to any general characteristic of this environment or name the plants and fruits therein. However, the animals were known by most people. It is highlighted that even if a person did not know any general feature, plant or fruit of this biome, they could have spoken of trees, bushes or any other simple characteristic, yet much of the population interviewed did not say anything about this environment. We conclude that contemporary lifestyles have alienated this population from the environment they live in and that they do not realize that their survival is closely tied to it. This may be because these people no longer have a direct relationship with the environment as their ancestors did, and now, they must come to know the natural environment primarily through books, television, magazines and the internet.

Most residents of Bauru had never used a trail in the Cerrado region, which is a negative factor because Bauru presents options to connect directly with the natural environment, whether in the Botanical Gardens, the Zoo or in other areas where there are fragments of this biome. However, this population does not know how to enjoy or appreciate these opportunities, even though approximately 70% stated that they would like to know more about the Cerrado. It is necessary that the public be encouraged to participate in activities that celebrate our environment, either through videos, visits, music or hiking outdoors, environmental conservation classes or other activities, so that all people can realize that this environment exists and needs to be conserved.

Respondents who best know their environment were found to be those individuals with high scores related to conservation notions and intentions of action, as we expected. Thus, in agreement with Leff (2007), we affirm that environmental knowledge is essential to addressing the environmental crisis in which we find ourselves.

When relating environmental conservation notions, actions and intentions and respondents' education level, it is noted that among those who were illiterate people or who had attained up to an elementary education, low scores were more predominant than high scores; among people with a high school education, this also occurred, although the difference was not as great; among people with higher education, the number of individuals with high scores was greater than the number of subjects with low scores. This pattern may have occurred because with a higher education level, more knowledge is acquired and, as a consequence, environmental conservation attitudes are adopted.

After collecting and analyzing the data and comparing them with the theoretical framework of Enrique Leff (2007), agreeing with with the Leff that the environmental crisis is related primarily to problems of knowledge. It is also said that humanity is increasingly externalizing the environment where they live and worrying less about the conditions of that environment because each day, the rhythm of life requires people to worry more about traffic, their jobs, family and many other factors present in their daily lives.

Due to the current environmental crisis, it is possible to see the effects of human externalization of the environment and the consequent contempt for it. In addition, we realize that generation after generation is being raised on such principles. Most of the products and materi-

als consumed are produced in factories or laboratories, but humans forget that all of our needs are closely linked to the environment in which we live. Much environmental knowledge, even if not scientific, was traditionally passed from generation to generation, a custom that is increasingly disappearing. After understanding what is happening to humanity, i.e., the destruction that is being caused to our environment, in addition to decreasing knowledge and increasing ideals of consumerism and limitless exploitation, it is sought an epistemology that can show people how knowing about the environment is critical to living in it in a sustainable way.

In a country such as Brazil, with its immense biodiversity, it is extremely important to understand and value such wealth. As noted by Leff (2007), it is necessary to integrate the various existing fields of knowledge, as well as the emergence of new fields of knowledge, with a recognition of people, their traditional knowledge and their values as part of their cultural identity and natural resources.

As stated by Leff (2007), it is necessary to develop an epistemology that does not apprehend the object of knowledge in its entirety but, rather, is able to acquire new knowledge about the environment and acknowledges the weakness of modern science in facing the challenges of environmental crises and the complexity of the world.

Like Leff (2007) and Morin (2003), it is also criticized the unidirectional thought prevailing today, and it is believed that it is related to the causes of the environmental crisis. Leff argues for the development of an environmental knowledge, a new epistemological stance that does not seek unidirectional knowledge but, instead, proposes a gathering of the knowledge and experience of social actors such as traditional communities, social movements and groups that are recognized as the bases of an environmental rationality. Morin argues that in unidirectional thinking, the parceled intelligence unidimensionalizes the multidimensional, thereby eliminating all possibilities of understanding and reflection and with it all possibility of a corrective judgment or a long-term vision by the people. Due to its inability to visualize the context and planetary complexity, that form intelligence becomes blind, unconscious and irresponsible.

It will not be helpful to increase the amount of advertisements in the media showing how people should save the environment if contemporary thinking is not changed. It is necessary to build a new environmental rationality that is consistent with that proposed by Leff (2007), one that is based on the ecological potential and cultural meanings of life, ethics and otherness and in a politics of difference.

Agreeing with Leff (2007) states that education should prepare new generations to not only face ecological disaster with the skills and capacity to handle the unexpected, but, above all, prepare them mentally to be able to understand the interrelationships that constitute their ways of life, to create new skills to develop new ways of doing things. It is an education that prepares individuals for the construction of a new rationality, to end this culture of hopelessness and alienation that is plaguing humanity. There needs to be an education that allows a process of emancipation, which enables people to develop new forms of reappropriation of our world before it is destroyed.

Therefore, this research is presented in hopes of increasing reflection about this new environmental epistemology, which puts the human being as inherent to the environment, integrates attitudinal issues, is axiological and reconstructs our way of looking at environmental issues.

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Advised by Milan Kubiátko, Masaryk University, Czech Republic

Received: *May 29, 2013*

Accepted: *June 14, 2013*

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