

Biofilia y emociones: su impacto en un curso de educación ambiental

Biophilia and emotions: their impact on an environmental education course

Martha Patricia Sánchez Miranda

Universidad Autónoma de Nuevo León, México

marpa30@gmail.com

Arturo De la Garza González

Universidad Autónoma de Nuevo León, México

agarza7@gmail.com

Resumen

El objetivo de la presente investigación es indagar sobre el impacto del empleo de los valores de la biofilia en un curso de educación ambiental. En total participaron 78 estudiantes de la escuela de psicología de una universidad pública de México. Se utilizó un diseño cuasi-experimental en tres fases. La primera y tercera fases fueron de evaluación, antes y después del curso, mientras la segunda tuvo lugar durante la impartición del curso. La evaluación utilizó la técnica de facilitación afectiva. El curso consistió en la presentación de 11 documentales con base en los nueve valores de la biofilia, para su posterior discusión. Los resultados indican que los jóvenes presentan un cambio en su percepción emocional hacia los ambientes naturales después del curso. Se discuten las implicaciones teóricas en torno a los aspectos emocionales y la biofilia, así como las aportaciones empíricas de los resultados, además de plantear su posible aplicación en otras áreas.

Palabras clave: biofilia, facilitación afectiva, emoción, educación ambiental.

Abstract

The objective of this research is to investigate the impact of the use of the values of biophilia in a course of environmental education. Participated in total 78 students from the school of psychology at a public University in Mexico. A quasi-experimental design was used in three phases. The first and third phases were assessment, before and after the course, while the second took place during the delivery of the course. The evaluation used the emotional facilitation technique. The course consisted in the presentation of 11 documentaries based on nine values of biophilia, for further discussion. The results indicate that young people have a change in their emotional perception to the natural environments after the course. Discussed the theoretical implications around the emotional aspects and the biophilia, as well as empirical contributions of the results, as well as raise their possible application in other areas.

Keywords: biophilia, affective facilitation, emotion, environmental education.

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Introduction

Environmental issues is a current issue that impacts all of us in many ways, so it is very important to not only have the relevant information, but also actually change our behavior in ecological terms. Today, educational institutions offer courses on environmental education, which basically contain technical information about various environmental issues and are still somehow a traditionalist education (González, 1996). Although these aspects are valuable, they were not sufficient at the moment cause changes in our behavior. So it is important to take into account other aspects, as well as the cognitive, when developing these programs, such as the affective factors. In this sense, Pooly and O'Connor (2000) suggest that environmental education courses should focus on attitudes, emotions and environmental beliefs. Through the study of emotional states that different environments cause in people, it would be useful to determine if they can be of benefit at the time of developing a course. The aim should be to cause a profound

change of consciousness with respect to our position and relationship with nature, so that in this way occurs in behaviors that resolve environmental problems.

Environmental education One of the primary goals of environmental education is to change the behavior of human beings by environmental behaviour, i.e., the realization of a series of actions that allow to maintain the balance in natural resources and thus reduce environmental deterioration (Boada and Escalona, 2005; González, 1996). To do so, much of the environmental education programs working in awareness on these issues, as environmental awareness to the specific psychological factors that individuals possess and use to engage in environmental behaviors (Zelenzy and Schultz, 2000). Within this concept, it is possible to detect psychological dimensions, which are classified in: emotional, which can be both positive attitudes and negative; dispositional, i.e., those personal actions that denote responsibility; cognitive, or information owned by the individual on environmental issues; and environmental activism (Jimenez and Lafuente, 2010).

The investigations of the last decade have focused on the study of the connection or identity that humans feel towards nature as a key point in the actions of pro-environmental type. The connection to nature is defined as the close relationship we have with all living beings (Nisbet, Zelenski and Murphy, 2009). Such emotional affinity is considered part of the Biophilia (Mayer, Frantz, Bruehlman-Senecal and Dolliver, 2009).

From this perspective, an environmental education course must take responsibility to develop in participants the above dimensions. To do this, an alternative is to resume biofilia as a model to guide and allow to raise awareness about the need to change environmental behavior of human beings.

Biophilia Hypothesis and environmental education

Biofilia conceptualizing proposed by Edward O. Wilson (1989), it states that it is the innate tendency of all human beings to feel identified with nature. This has a genetic origin, caused by our evolution in natural areas. In addition, it is an aspect of adaptive utility that has allowed us to survive in our environment. Biophilia leads man to experience a range of emotions ranging from aversion to attraction, fear of indifference and tranquility to be anxiety. Many of these feelings arose because of the web of symbolic networks, ie, a combination of cultural and innate factors that will remain throughout the generations.

Wilson, along with sociologist Kellert, proposed nine values related biofilia (Kellert and Wilson, 1999). These values are found in different cultures and involve different aspects of our personality and behavior, which are: (a) naturalist emotions appreciation for nature, (b) scientific and environmentalist: the pursuit of knowledge of nature, (c) aesthetic: nature seen as beautiful, harmonious and balanced, (d) symbolic: use of analogies of the elements of nature, (e) humanist: emotional attachment to certain species, leading to their protection, (f) moralist : emotional affinity and ethical responsibility, (g) naysayer: negative emotions that allow survival, (h) dominator: use and modification of the natural environment, (i) utilitarian: see nature as a resource.

In all these values the affective through positive or negative emotions are involved, which is of interest to conservation and environmental education psychology as it would preserve natural environments.

To date courses have not been found where the Biophilia is proposed as a means for changing our behavior. However, there are studies and proposed working with environmental awareness and where the connection we have with nature, like Cohen (2008) is used. This author proposes a model called the Web of Life, which states that human beings can improve their personal, social and natural level by developing sensory abilities.

Also, Ernest and Theimer (2011) evaluated seven environmental education programs, in order to detect whether exposing children to natural environments favored the increase of connection with nature. Their findings indicate that only two programs increase connectivity. Despite not having conclusive results, we can say that is not enough to be in nature, but we must address other factors that can increase connectivity.

In the same vein, Olivos-Jara, Aragonés Navarro-Carrascal (2013) conducted a study before and after exposing college students to a natural environment. They were given information about the type of ecosystem and creatures that live there, in order to see if the intervention increased connectivity with nature. The results show an increase in connectivity of students.

Meanwhile, Hung (2010) proposes an education through a ecofilia thinking and emphasizes the need for ecological literacy. In its work outlines a series of conceptualizations and suggestions on this literacy, but without empirical demonstrations and practical applications for a course.

While these studies have tried to change the conceptualization of environmental education for more experiential courses, like Cohen, they do not handle the concept of Biophilia, do not

address Kellert proposed by Wilson and values, nor assess an aspect that is of interest, as are the emotions generated by various natural environments. Therefore it would be important to use the Biophilia as a leader in the development of an environmental education program.

Affective priming

Biophilia affective aspects involved in their values, so it is significant to have instruments capable of measuring these emotional aspects in the interaction of people with their environment. There are countless psychological instruments that pursue this objective, whether explicitly, as surveys, tests, scales, etc., or as implicit instruments that seek to determine the manifestation of these emotional issues.

An advantage of embedded instruments is that they do not involve the conscious aspects of people and, therefore, the effects of social desirability that affect the answers given by the participants (Greenwald, 1990). Within these instruments is the affective priming. When working with semantic knowledge representation is also possible to explore the models of emotional information we have about the world around us. In addition, it is assumed that we have emotional cognitive mechanisms that may be assessed by the response times that subjects manifest to different stimuli, called by cognition as "cognitive theories of valuation" (appraisal theories) (Fazio, 1995; Klauer and Musch, 2003).

The paradigm of affective facilitation and semantic nodes and associated state that the information is organized in information networks, both emotionally and meaning, which are stored in long term memory. These associations are going to change as the individual experiments with different objects and / or events throughout his life (Fazio & Olson, 2003; Oskamp and Schultz, 2004). Most of the information has an emotional valence. For their study were developed by different affective priming experiments in various forms, presenting visual stimuli, lexical, auditory or olfactory type (Banse, 2000; De Houwer, and Eelen Hermans, 1998; Hermans, and Eelen Baeyens, 1998). These act as promoters of an emotional valence and representation that underlies them.

The technique involves three successive presentation of stimuli. First an attachment point for a period of 500 milliseconds (ms). After a stimulus is shown for about 250 ms, known as facilitator stimulus. Finally, a stimulus that remains displayed indefinitely until the person gives an answer is presented. The participant's task is to decide whether or not last stimulus emotional valence.

The time it takes to give the subject response (reaction time) is what determines the emotional valence of the stimulus facilitator.

If the time is less than half the lens has a positive valence, it means that the stimulus was presented before has a positive valence, and otherwise if it were higher. When the pair of target stimuli facilitator require less time to evaluate, it is said to be congruent; whereas if the time is greater, they are considered inconsistent (Morales, Lopez and Hedlefs, 2010). That way, you can determine the emotional valence of a stimulus, presenting a facilitator and measuring the time it takes to determine whether or not the objective has emotional content.

Affective priming in environmental issues

Few studies working with affective priming technique in the environmental field and even less in environmental education. Among which may be mentioned are the work done by the team Hietanen. In their research they used images for facilitators of natural and built environments that have the characteristic of low, medium and high restoration, measured with a scale. They face images as targets denoting positive and negative emotions were presented. The results indicated that the images of nature with high restoration were perceived as positive (Hietanen, Klemettilä, and Korpela Kettunen, 2007; Hietanen and Korpela, 2004). Similar results were obtained Korpela, Klemettilä and Hietanen (2002), but instead of using faces as targets, used sounds denoting positive and negative emotions.

On the other hand, Sánchez, De la Garza and Rangel (2013) studied the evaluation of (natural and urban) environments, using words related to natural and urban environments as facilitators, and adjectives with positive and negative emotional content objectives. Among its findings detected two groups within the study sample, one evaluates natural environments with positive content and positive and one negative, indicating in this case a negative assessment of natural environments.

In the same vein, Schultz and Tabanico (2007) worked with explicit measures or implied, and the latter used the Implicit Association Test (IAT for its acronym in English) in order to test for changes in connecting people They perceive after spending time in natural environments. The results indicate that participants feel more connected with nature that implicitly through explicit measurements.

Therefore, the present study aims to determine the impact of values biofilia in emotional evaluation of natural environment after attending a course of environmental education through

affective priming technique. Therefore, the following hypothesis is proposed: if biofilia values are capable of causing a change in the emotional perception of natural environments into positive emotions, then these should be manifest in a greater number of participants with shorter reaction times for positive words related to nature and positive goals, having participated in the course.

Methodology

Design

This research was conducted in three phases, the first and third phase consisted of evaluating students who participated in the environmental education course, the second consisted of the delivery of the course. A quasi-experimental design was used with measurements before and after the course. Three factors were used, the first was the kind of atmosphere, consisting of three levels, where words related to natural environments (N), city (C) and neutral (NU) were used. The second factor was the valence of these environments: positive (P), negative (N) and neutral (NU); these two factors belonging to the facilitators stimuli. The third factor is the objective, which consisted of words with emotional valence of three types: positive, negative and neutral (see Table I).

Table I. Combinations of factors design 3 x 2 x 3.

OBJETIVO	FACILITADOR					
	NATURALEZA (N)		CIUDAD (C)		NEUTRO (NU)	
	POS(P)	NEG(N)	POS(P)	NEG(N)	NEU(NU)	NEU(NU)
POS(P)	NP-P	NN-P	CP-P	CN-P	NU-P	NU-P
NEG(N)	NP-N	NN-N	CP-N	CN-N	NU-N	NU-N
NEU(NU)	NP-NU	NN-NU	CP-NU	CN-NU	NU-NU	NU-NU

Nota: POS(P)= positiva, NEG(N)= negativa, NEU(NU)= neutro, NP= naturaleza positiva, NN= naturaleza negativa, CP= ciudad positiva, CN= ciudad negativa, NU= neutro. The first characters before the script are a facilitator with the combination of environment and valencia, then there is the kind of goal. The neutral facilitators have valence and repeated twice to balance the amount of stimuli of city and nature.

Participants

The sample was not random and convenience, consisted of 78 students of a Mexican public university. They have the same characteristics in terms of socioeconomic status, besides living in the same city. The mean age was of 20.19 years ($SD = 3.69$) and gender have a distribution of 21% men and 79% women.

The exclusion criteria were established that consisted eliminate subjects who committed more than 20% of errors in the study. Also, those participants whose average reaction times of all test exceeded two standard deviations above the overall average of the study. At the level of individual data, times exceeding 1500 ms and the wrong answers were replaced by the average reaction time of the respective experimental condition. Using these criteria a total of eight subjects were excluded, leaving 70 in total for analysis.

Instruments

First and third stage: affective priming test

The instrument was developed by a computer program in visual studio. It was implemented in Windows 7 laptops with screens of 14 inches. The brightness of the screens was set at the same level.

The technique consisted in the presentation of three stimuli, the first is an anchor to the center of the screen for 500 ms. Upon completion of this time a word appears 250 ms, this is called facilitator. Continuing a blank screen for 50 ms; the sum of these times (300 ms) is known as SOA (stimulus onset asynchrony). Finally, it was deployed in other word (target stimulus) screen, in which participants respond if you have emotional content or not (Figure 1). This word remains until the participant make a choice (Morales et al., 2010).

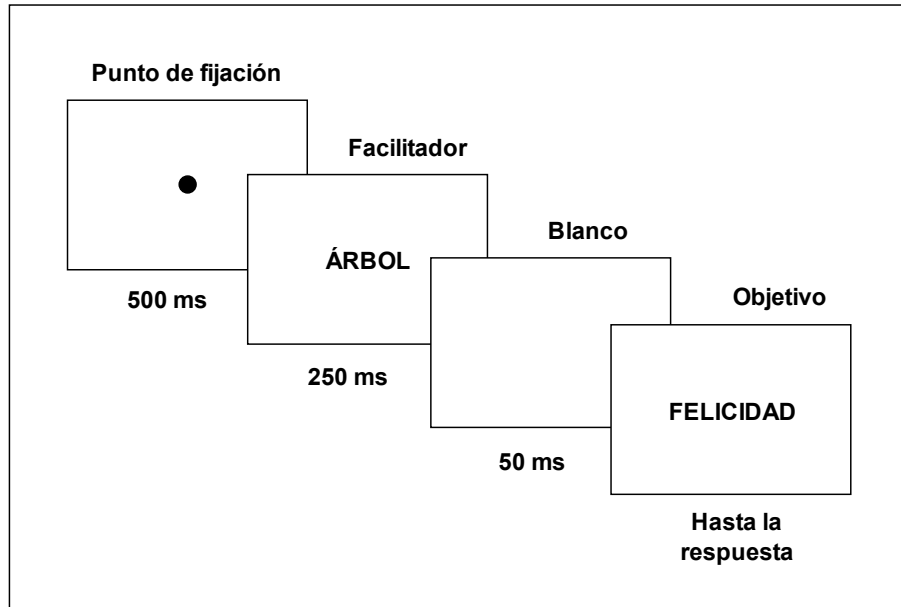


Figure 1. Sequence of screens from the study.

For facilitators stimuli words related to both natural and urban environments were used. These resumed the study by Sanchez et al. (2013), which validated a similar instrument that was used in this investigation. Words of geometric figures as experimental control (see Table II) were also included. The purpose is to maintain balance in the experiment for that reason the same amount and type of stimuli used valences.

Table II. Words used as facilitators stimuli.

NATURALEZA(N)		CIUDAD(C)		NEUTRAS(NU)
POS(NP)	NEG (NN)	POS(CP)	NEG (CN)	(NU)
CASCADA	BUITRES	PLAZA	CANTINA	CRUZ
MONTAÑA	CIEMPIÉS	CINE	TRÁFICO	ESTRELLA
BOSQUE	MURCIÉLAGO	FUENTE	SMOG	TRIÁNGULO
FLORES	TARÁNTULA	CIUDAD	BASURA	CÍRCULO
SELVA	ALACRÁN	UNIVERSIDAD	FÁBRICA	CUADRADO

The target words were concepts with emotional content, both positive and negative valence. Names geometric figures as neutral stimuli were employed, since they lack emotional content (see Table III). They were used in the same proportions to balance the instrument.

Table III. Target words.

POSITIVAS (P)	NEGATIVAS (N)	NEUTRAS (NU)
AMOR	MIEDO	CRUZ
SERENIDAD	TRISTEZA	ESTRELLA
OPTIMISMO	ODIO	TRIÁNGULO
TRIUNFO	TEMOR	CÍRCULO
FELICIDAD	FASTIDIO	CUADRADO

Second phase: environmental education course

The course was the presentation and discussion of audiovisual documentaries, which were exposed in the classroom. At the end of such a series of dynamic discussion on its contents it was conducted.

Four videos of life series: 11 documentaries were used in all plants, insects, birds and primates; two corresponding to planet earth, freshwater and oceans, both from the BBC; The Story of Stuff with Annie Leonard; The Lightbulb Conspiracy Dannoritzer Cosima; An Inconvenient Truth by Al Gore; The last time Leonardo DiCaprio and Home by Yann Arthus-Bertrand. The first videos are related to the initial six biofilia values. The last five emphasize the three final values. The videos are distributed according to their relationship with the values of the Biophilia.

Procedure

Affective priming test

Participants were invited to collaborate in research voluntarily. They were informed in detail what was the purpose of the study, as well as its content. Moreover, it was clarified that the data provided will be treated anonymously. Those who accepted were taken to an isolated room, were given a computer and received instructions. There they were told would observe a point in the center of the screen and appear immediately after a word that should only read; then appear on

another word which must decide whether or not he had emotional content. To give your answer had to press the blue button with the word NO (in the letter Z), and if your answer was yes had to press the yellow button with the word YES (corresponding to the M key). He was requested to respond as quickly as possible. Before starting the test, they were allowed to practice with 10 pairs of stimuli not counted in the assessment. The instrument consisted of five blocks, with a pause between each. Each block contained 18 pairs of facilitator target stimuli presented randomly. In each block he is searched that the proportions of the different types of stimuli are presented.

Environmental education course

The course lasted 16 weeks, of which the first and last were used for evaluation of the participants through the instruments mentioned in the test section of affective facilitation. The sessions have a duration of 1 hour 40 minutes per week, and the documentary *An Inconvenient Truth*, the last hour and two sessions were used home because of its duration. During the first hour the documentary was projected, and the end was made in plenary discussion of the material observed by detonating questions. It was to bring the participants to reflect on a particular aspect of the video, addressing each of the values of the Biophilia as a guide.

Results

Data analysis was performed with Statistica package version 10, taking a significance of $p = .05$ reference. In order to determine the number of subjects showing a positive emotional evaluation to natural environments, a preliminary classification was carried out by calculating the difference in reaction time between experimental conditions NP-P and NP-N for both data before (pretest) and after (posttest) course. When the obtained value is negative, that is, the time condition NP-P is smaller than NP-N, it is considered that the subject has a positive emotional perception into natural environments; We call them the green. If this value is positive, it will have a negative perception of nature and city dwellers call. In the same way, to explore the behavior of words with negative connotation of nature, the same approach with the conditions and NN NN-P-N (see Table IV) was used.

Table IV. Preliminary classification of words related to nature.

	Palabras naturaleza positivas (NP-P - NP-N)		Palabras naturaleza negativas (NN-P - NN-N)	
	Pretest	Postest	Pretest	Postest
Verdes	35	42	40	43
Ciudadinos	35	28	30	27

In order to analyze the behavior of participants on words related to the city, the same criteria mentioned above for the preliminary classification was used, calculating the difference between the reaction times for the conditions CP-P - CP-N and CN-P - CN-N. As seen in Table V, the results showed minimal variation before and after the course.

Table V. Preliminary classification of words related to city.

	Palabras ciudad positivas (CP-P - CP-N)		Palabras ciudad negativas (CN-P - CN-N)	
	Pretest	Postest	Pretest	Postest
Verdes	36	38	35	37
Ciudadinos	34	32	35	33

To verify the results of the preliminary classification and the behavior of each of the variables was performed discriminant analysis, both pretest and posttest data. The results indicated that the variables NP and NP-P-N are those with the greatest influence in the analysis (Wilks Lambda of 597,708 and 723,149 respectively). The pretest analysis included two additional variables, NN-N and CN-P, but with a lower incidence in the sort function due to its low contribution to the Lambda of Wilks (597,708 and 447,119 respectively). In the post-test analysis of data, only those variables related words positive nature environments (NP) which were included in the final model (Wilks Lambda of 592 271 and 550 327). Regarding the classification of the participants,

the discriminant analysis slightly amended preliminary classification, changing only some participants category (see Table VI).

Table VI. Final standings discriminant analysis.

	Pretest	Posttest
Verdes	32	46
Ciudadinos	38	24

To verify whether the difference in the number of participants of this classification, before and after the course is significant from a statistical point of view, a test of Chi2 was performed by detecting this change is not due to chance ($\chi^2 = 5.67, p = .017$). Further, a mixed ANOVA was performed to designs in order to determine the behavior of the reaction times between the two categories raised.

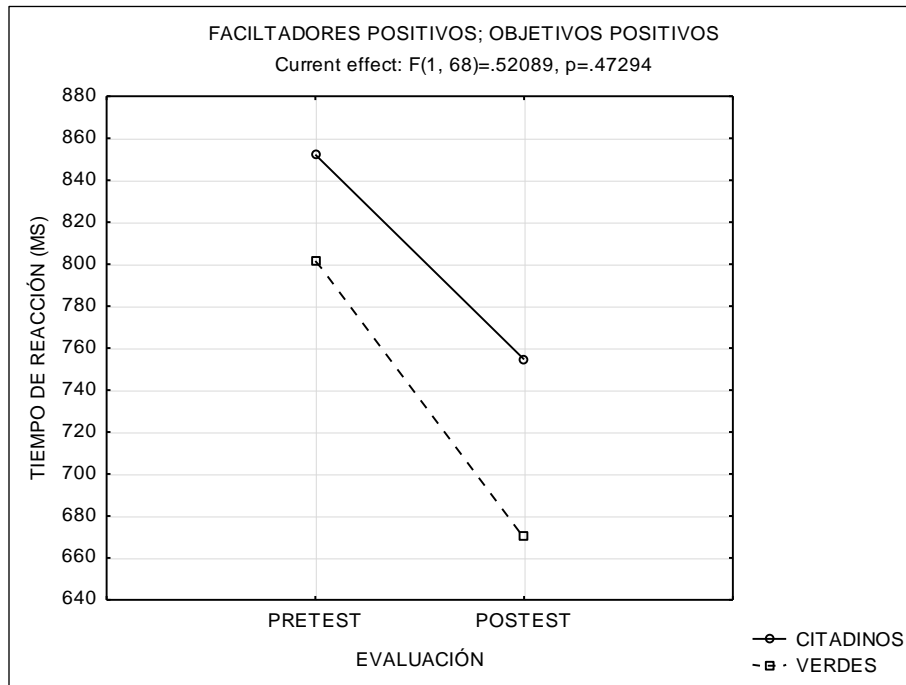


Figure 2. ANOVA facilitator with words of positive nature and positive goals.

Figure 2 shows the reaction times are observed when words positive nature as facilitators and positive words are used as targets, and Figure 3 shows the same but with facilitators negative objectives. As can be seen, in both cases there is a decrease in reaction times after the course.

Also worth mentioning that green participants (dotted line) have shorter reaction times for the positive goals negative, compared to city dwellers (solid line) that show the opposite behavior (see Figure 3).

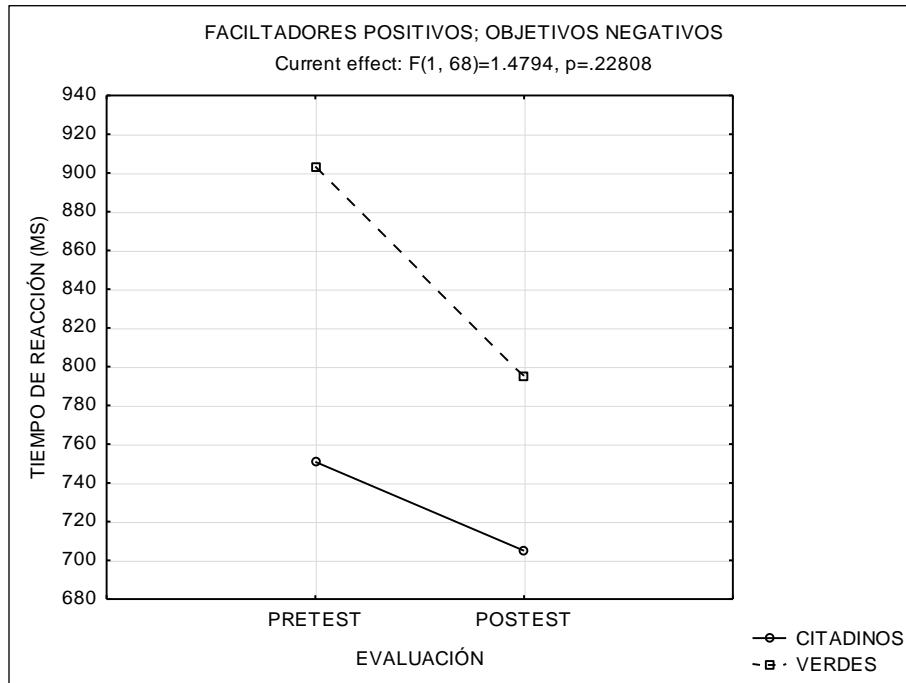


Figure 3. ANOVA facilitator with words of positive and negative nature objectives.

Additionally a planned comparison between city dwellers and green, where it was found that the positive goals show a significant difference between the categories with the following values $F(1,68) = 7.84, p = .006, \eta^2 = .26$ was performed. Whereas in the negative objectives it is also obtained a significant difference: $F(1,68) = 23.94, p = 0.00001, \eta^2 = .71$.

Discussion and conclusions

The results showed that the experimental conditions where nature-related words were used, indicate a change in reaction time, resulting in faster by presenting words as facilitators and positive goals. These differences are manifested in a greater number of subjects exhibiting a positive assessment of concepts that have meaning related to natural environments, having participated in the environmental education course. Therefore the hypothesis is accepted.

This is of importance, it would imply that it is possible to change the perception that young people have of nature through courses to work on emotional aspects rather than technical, as proposed by Cohen (2008) and Hung (2010). This shows that it is important to emphasize multimedia elements present in these courses, because it appears that assists in changing the perception people have about the natural environment (Kahn, 2011; Kahn, Severson and Ruckert, 2009).

It is worth considering that in nature-related words that have negative connotations, the proportions of participants showed no significant change after the course. This implies that the course did not have an impact on how these words are evaluated. One possible explanation is that the words used are related to issues that evoke negative emotions, with the possibility that these possess a strong innate nature, resulting in changing the valence would be very difficult (LeDoux, 2003; LeDoux and Phelps, 2008). In addition, we should ask whether this would be really useful, since the purpose of the course is to regulate the perception people have of the natural environment in general and not necessarily that these emotions disappear. In other respects, this research would be giving support to the ideas of Wilson and Kellert on biofilia. This is noteworthy, since it would mean that the proposed values would be finding evidence in experimental data, similar to those found by Sánchez, De la Garza, Lopez and Morales (2012) study with a scale; besides Olivos et al (2013) when exposed to natural environments college students evaluated before and after explicit instruments and Tabanico and Schultz (2007), with an implicit instrument.

Not to mention the utility of using these concepts as a guide to change the perception that people have of the natural environment. Thus, their possible practical applications expands, not only in the field of education but also in assessing public spaces, offices, workplaces, etc. (Nieuwenhuis, Knight, Postmes and Haslam, 2014).

On the other hand, it is important to note that the affective priming technique was able to detect the perceptions of the participants, coinciding with what they found Sanchez et al. (2013), Hietanen et al. (2004, 2007) and Korpela et al (2002). In addition, the instrument demonstrated the ability to detect changes in the emotional evaluation before and after the course of environmental education, which is important because it opens the possibility of applying this technique in other areas.

With regard to the limitations of this research, it can be mentioned that was applied to a small number of students of psychology, and it would be advisable to work with participants who are not students. Similarly, it would be appropriate to study whether these results relate to other types of (implicit and explicit) measures, where they can study some aspects of environmental awareness and activism as available (Jimenez and Lafuente, 2010).

In summary, we see that it was possible to modify the emotional perception people have towards natural environments through an audiovisual and discussion course, based on the values of Biophilia. This research provides the practical possibility of modifying the emotional aspects of people using as a guide the biofilia. In the empirical area, to interpret the data as evidence for the hypothesis proposed by Wilson Biophilia. Similarly, the results obtained by Sanchez et al confirmed. (2013), in the sense that affective priming technique is capable of measuring the emotional affinity participants with different environments, and possible changes.

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