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Environmental Education As A Strategy That Promotes The Conservation Of Trachemys Callirostris (Turtle) In Students Of The Santiago Apostle Educational Institution, Sucre, Colombia

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ABSTRACT:

Trachemys callirostris (Turtle), is a species that during the last decades has been submitted to a high extraction activity in all the regions where it is distributed at national level. This strong pressure has resulted in a marked decrease in the size of their populations. The present work had as purpose to foment in the students of eleventh grade of the Educational Institution Santiago Apostle from the environmental education positive attitudes that promote the conservation of the species in this community. In order to achieve the proposed objective, seven environmental education workshops were held for 57 students between the ages of 15 and 19. The activities were developed in three phases or stages: 1) design and validation of an instrument to evaluate the level of knowledge, perceptions and actions to conserve the turtle in the region. In the second phase, the instrument was applied to the student population and the thematic lines of the didactic booklet used in the intervention process during the third phase were defined. It is observed that the students have good knowledge about the living conditions of the turtle and the forms of conservation; however, they have some inaccuracies in reproductive aspects and morphological differentiation between males and females. In addition, they have misperceptions about the biological importance of the species, which is why it is important to develop environmental education activities not only with students, but also with members of the community in general and to evaluate their effectiveness.

Key words: *conservation, environmental education, strategy, turtle, Trachemys callirostris.*

Introduction

Colombia is one of the richest countries in the world in flora and wildlife, being the first country with the greatest diversity of birds, the fourth in mammals, the third in reptiles, the second in amphibians and perhap[1]s the first in insects (López et al., 2012). Regarding turtles, Colombia has 32 species of turtles (five marine species and 27 continental species), grouped in nine families and 16 genres. If only the 27 continental turtle species are considered, this country ranks seventh in the world in terms of turtle richness (TTWG, 2014), which is due among other factors to the great diversity of ecosystems existing in the national territory, allowing to find a differential representation of species by regions. Unfortunately, according to the IUCN (c2014) and (Castaño, 2002), more than 40.0 % of the species are under some category of threat, mainly due to indiscriminate hunting, alteration and degradation of their habitats, environmental pollution and illegal trafficking (Castaño, 2002; Rueda, 2007, Páez et al., 2012), which are essentially anthropogenic actions. All these factors, added to the countless predators in their different stages of development, have resulted in a marked decrease in the size of the populations (Bernal et al., 2004; Rueda et al., 2007), to the point that some of them have been brought to the brink of extinction (Baptiste et al., 2002).

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Due to the large number of endangered turtle species in the national territory and for the reasons mentioned above, in 2002 the Ministry of the Environment published the national program for the conservation of marine and continental turtles (MMA, 2002), which aims to guarantee the survival of all species, implementing strategies for conservation, research, valuation, use and management, through coordinated inter-institutional work and with the participation of the community. Additionally, in 2009, the Ecosystems Directorate, as part of its Conservation and Sustainable Use of Biodiversity work program, jointly formulated with the National University of Colombia, the "Management Plan for the sustainable use of the turtle (Trachemys venusta and Trachemys callirostris), by the rural communities associated with the distribution area of the two species in Colombia", through which it sought to provide elements to achieve the management, sustainable use and conservation of the turtle in its distribution areas in the Colombian territory (MAVDT-UNAL, 2009).

On the other hand, at the regional level, some specific work has been done on the conservation of turtle species, however, most of this information is not published or available for consultation (Páez et al., 2012). However, for the Caribbean region it is important to highlight the work carried out by the Corporación Autónoma Regional de los Valles del Sinú and del San Jorge-CVS, together with Conservation International - CI, which developed the project "Management and Conservation of Threatened Species of the Lower Sinú", which includes a management plan for each of the species: Chelonoidis carbonaria, Trachemys callirostris, Mesoclemmys dahli and Podocnemis lewyana (CVS and CI, 2006). In the case of the turtle and the river turtle, actions focused on maintaining the natural populations of the species by mitigating the impacts that affect them, improving their habitat and strengthening community processes were formulated. Within this framework, actions have been developed to rescue and artificially incubate turtle nests during the reproductive season, restoration and reforestation activities have been carried out in critical areas within the Ciénagas with the intention of improving habitats, and the community program was strengthened through training on issues inherent to the management plan (Páez et al., 2012), which should be articulated with legally constituted associations, human groups, and other stakeholders.

Faced with this situation, environmental education emerges as an essential conservation strategy, since it is aimed at changing the attitudes and behaviors of local communities to promote sustainable actions in the region (Martínez, 2010). Taking into account the above and the high extraction activity of Trachemys callirostris (Gray, 1856) in the township of Santiago Apóstol, Sucre (Jiménez and Gándara, 2021), the purpose of this study was to promote positive attitudes in the eleventh grade students of the Santiago Apóstol Educational Institution through environmental education that promote the conservation of the species in this community. This study is a fundamental part of the activities developed within the framework of the school environmental project (PRAE) "Let's take care of the hicotea", which emerges as an important tool that seeks to provide a solution to a specific environmental problem.

Method

The approach of the study is quantitative, analytical and with a cross-sectional design, using a questionnaire that integrates the variables: knowledge, perceptions about threats and actions for conservation purposes, applied to students of the Santiago Apóstol Educational Institution, in the department of Sucre. The research was developed in three phases or stages following the guideline of the research objectives. In the first phase, the questionnaire was designed and validated following Supó's (2013, pp.31-60) procedure of review of the circulating literature, formulation of the items, semantic adjustment and expert assessment. Subsequently, a pilot test was carried out, statistical validation was performed by determining its internal consistency using cronbach's alpha and the adequacy parameters were determined. In the second phase, the instrument was applied to the student population, the information obtained was analyzed and the thematic lines of the didactic booklet used in the intervention process were defined. Finally, in the third phase, the intervention was carried out using the primer and a satisfaction survey

was conducted to close the process.

Results and discussion

In the first phase, the first specific objective of this study was achieved: to design and validate a questionnaire to identify the knowledge, perceptions and actions of students regarding the species.

To achieve this, the questionnaire was designed according to the contents of Table 1, going through the review of the judges or experts who contribute to improve the formulation of the questions according to the coherence with the variables and the semantics of the text. Next, a pilot test was conducted with 88 students applying the initial 22-item questionnaire. With these results, the statistical analysis was carried out, which served to eliminate 6 to obtain an instrument with 16 items that had a Cronbach's alpha of 0.82, thus showing good internal consistency. The adequacy of the instrument was determined using the statistical parameters KMO=0.77, for sampling together with a significance in Bartlett's test of sphericity of 0.000, thus allowing an exploratory factor analysis, where an extraction index greater than or equal to 0.3 was found in all the items.

Table 1. Structure of the instrument.

Variables	Dimensions	Items
Knowledge	Ecology	The hicotea is an animal that lives in swamps (1). A hicotea feeds mainly on aquatic plants (6) The hicotea is a reptile (7) The natural predators or enemies of the hicotea are the caiman and the babilla (8
	Reproduction	The time of the year when the female lays her eggs is between January and March (2). The nests of the hicotea are deep (3)
	Morphology	One difference between male and female hicotea is the size (4). Male hicoteas have a larger tail than female hicoteas (5).
	Conservation	The most commonly used method of catching hicotea is the chuzo (9). The method of catching hicotea that is most detrimental to the conservation of the species is the hook (10). The time of year when consumption of hicotea increases in the Caribbean region is Easter (11).
Threat perceptions		The importance of the hicotea in the region consists of the generation of economic resources for fishermen (12). Hicotea populations in the marsh have decreased considerably in recent years (13).
Proceedings		Intensive exploitation of the hicotea can lead to extinction processes in the marshes (14). Students should participate in actions aimed at conserving this species (15). The government is currently taking actions aimed at conserving hicotea populations in the marsh (16).

Source: The authors

By the procedure followed, three dimensions of the test were defined, corresponding to: knowledge, perceptions about the state of the hicotea and actions being taken to conserve it. Once the items for each of the variables were defined, the dimensions of the knowledge variable were established as follows:

Table 2. Dimensions of the knowledge variable.

Variable	Dimensions	Items
Knowledge	Ecology	1, 6, 7, 8
	Reproduction	2, 3
	Morphology	4, 5
	State or conservation	9, 10, 11

Source: The authors.

With the above, an instrument was consolidated that made it possible to evaluate the knowledge, perceptions and actions of a social group in relation to an animal such as the hicotea, which is under strong social pressure and requires precise and effective actions so that its threatened status does not become an endangered species.
In the second phase, the second specific objective of this study was achieved: to evaluate the knowledge and perceptions that students have about the species and the actions that are being taken for conservation purposes.
After the validation process of the instrument, it was applied to a sample of 57 students, 24 males and 33 females, aged between 15 and 19 years, and the following descriptions were obtained.

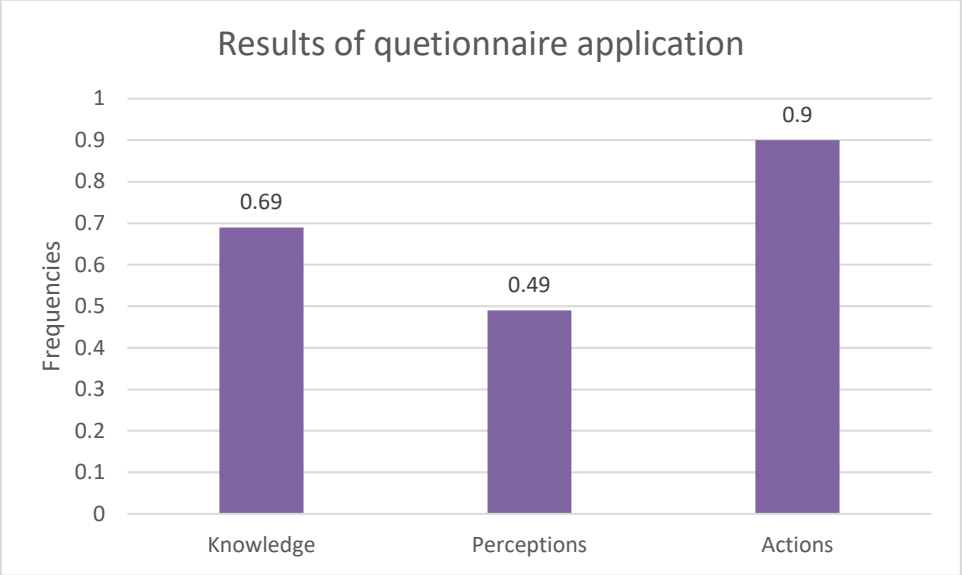
Table 3. Descriptive of the variables and dimensions involved.

VARIABLES	Dimensions	Media	Standard deviation	Variance
Knowledge		0,698	0,076	0,005
	Ecology	0,899	0,161	0,026
	Reproduction	0,596	0,302	0,091
	Morphology	0,017	0,092	0,008
	Conservation	0,953	0,115	0,013
Perceptions		0,491	0,238	0,056
Performace		0,906	0,204	0,041

Source: The authors. For dichotomous variables, the ratings are: 1 for success and 0 for failure.

Of the three variables evaluated, the one with the lowest average was that corresponding to the students' perceptions of the threats that affect the survival of the hicotea in the region. In relation to the dimensions of the knowledge variable, the ones with the lowest averages were reproduction and morphology. In relation to reproduction, it has a low average and a high standard deviation for the range of 0 to 1, which indicates that the students have doubts about the conditions required for the reproductive cycle of the hicotea to be successful. This result is complemented by the problems detected in the student population to correctly distinguish between males and females of the species by their morphological traits.

Graph 1 shows the average values for each of the variables under study.

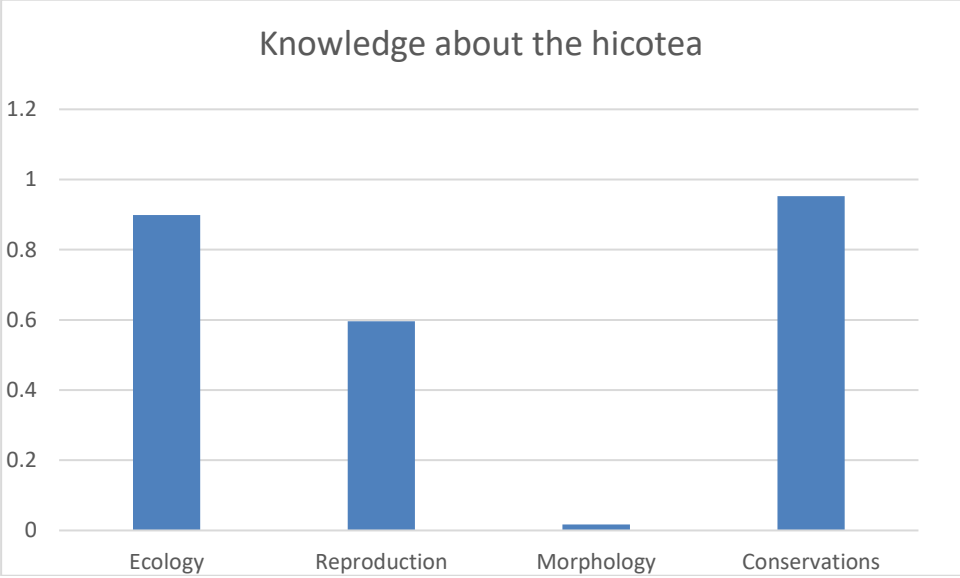


Average values for the variables knowledge, perceptions and actions. Source: the authors. The values range from 0 to 1. In this sense, 1 is assigned to success and 0 to failure.

The results obtained indicate that 50% of the students have erroneous perceptions about the biological importance of the species in the region and the social pressure resulting from indiscriminate hunting to which it is being subjected. This is consistent with statements that indicate that hicotea meat, in addition to its high nutritional content, has aphrodisiac properties. In addition, there are doubts about aspects related to reproduction and morphological differentiation between males and females. This observation is more evident in graph 2. In this sense, according to López et al. (2009), a lack of knowledge of the ecological roles of the species is reflected in a less positive attitude towards them. For this reason, it is important to establish environmental education programs, since they provide this type of information and generate learning through the construction and reconstruction of knowledge, which is reflected in new relationships, attitudes and behaviors towards species (Martínez, 2007). Students' attitudes and knowledge towards their local resources will largely determine biodiversity conservation (Bizerril, 2004).

However, providing this type of information is not enough since it has been shown that behaviors are also influenced by emotions and values (Mayer, 1998), so environmental education strategies should focus more on experiences than on lectures (Chawla and Derr, 2012). These affective and emotional bonds are created through direct contact with nature, which stimulates biophilia and with this, attitudes towards resource protection (Soga and Gaston, 2016; Zhang et al., 2014; Miller, 2005). In this order of ideas, the school environmental project (PRAE) "Let's take care of the hicotea", emerges as an important tool that seeks to provide a solution to a specific environmental problem of the context and whose initial purpose is to improve the knowledge and perceptions that students and members of the community in general have about the species.

Graph 2. Students' level of knowledge about the hicotea. Source: the authors.



It is observed that the students have good knowledge about the living conditions of the hicotea and the ways of conservation; however, they have some inaccuracies in reproductive aspects related to the time of the year in which the eggs are laid and the type of nests where they are deposited. In addition, they show difficulties in differentiating the sex of the hicotea by its morphological characteristics, specifically by the size of the specimen and the length of the tail of the male and the female. In this regard, several studies have shown a high degree of ignorance on the part of children and adolescents towards aspects related to the life history and ecology of wildlife such as bats (Galeano and Giraldo, 2012; Torres and Fernández, 2012), birds (Rodríguez, 2017; Möller et al., 2004) and turtles (Forero and Mahecha, 2006).

This fact reflects the need for environmental education activities that raise awareness of the importance of native biodiversity for children and adolescents. Likewise, there is a need for a better understanding on their part of their natural resources. which should be considered in the training processes within the framework of sustainability (Flórez, 2015).

With the above information, we proceed to achieve the third objective: To design a teaching strategy based on the principles of environmental education aimed at students in order to improve their knowledge, perceptions and actions in terms of the conservation of the hicotea in the subregion of San Jorge and Mojana sucreña.

After evaluating the knowledge, perceptions and actions of the population under study about the hicotea, a booklet was designed, which serves as a didactic resource to make an intervention in the context, whose purpose is to sensitize the population about the importance of its conservation for the community and positively impact the beliefs they have about the status of the species, in a region where it has a high social tension that can lead to a considerable decrease in their populations. For the elaboration of the primer, the following procedure was followed: Seven environmental education workshops were conducted with tenth grade students of the Santiago Apóstol Educational Institution, 24 males and 33 females, aged between 15 and 19 years old. The workshops were held from February to April 2023. The activities carried out in each workshop were framed in three phases or stages described below (Figure 1) according to Castillo and Sáenz (2019).

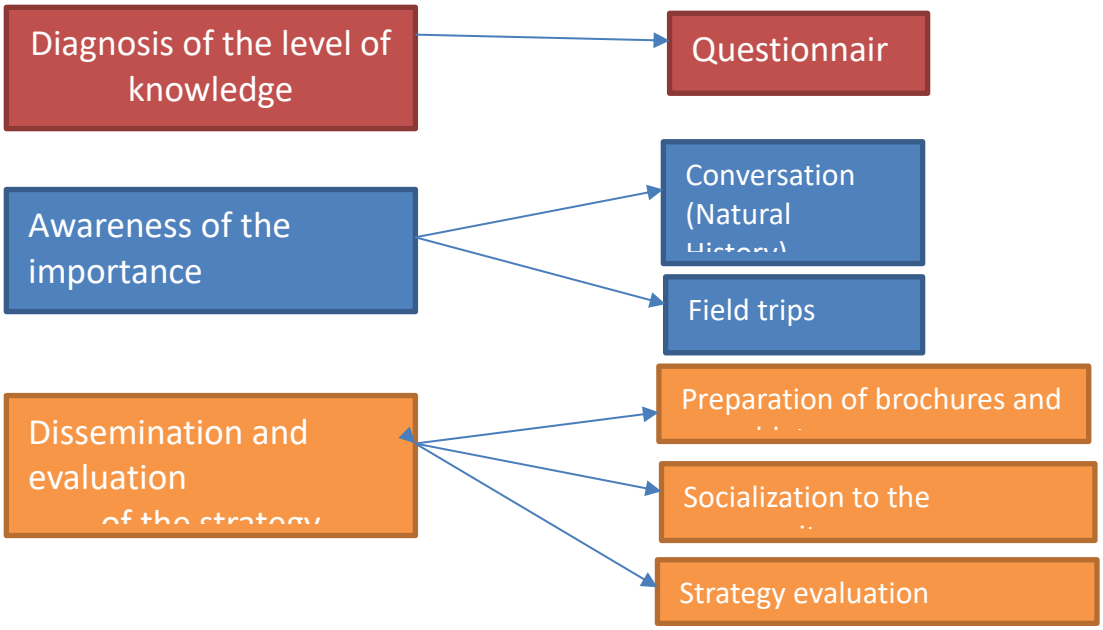


Figure 1. Methodological framework of the environmental education workshops conducted with students. Phase one in red, phase two in blue and phase three in green. Source: the authors.

During the second stage, informative talks were given, in which the students were explained aspects related to the natural history of the species (morphological, reproductive, behavioral and nutritional characteristics, life cycle and threats); in addition, field trips were made to the swamp, so that the students could come into contact with this ecosystem and see its current state. It is important to emphasize that all the sessions were worked in a didactic way where playfulness played a fundamental role, since "for people to learn, they must first find pleasure in learning" (Kinzie 1990, cited in Karaliotas, 1999). In this sense, different dynamics such as drawing, painting, word relation games, word searches and short representations were used. According to what was described above, there was great interest and active participation on the part of the students in the different activities developed in the workshops and field trips. It can be affirmed that this fact generated in them a sense of belonging, awareness and initiative in making decisions and carrying out practical activities related to the environmental problem in question. In addition, they developed skills in different activities such as painting, public speaking, handicrafts, teamwork, keeping a field notebook and establishing relationships between concepts.

In this regard, some authors have mentioned that play activities in environmental education promote participation, creativity, reflection, awareness and learning on the part of children and adolescents (Espejel and Flores, 2017; Ramírez et al., 2011). The duration of the work with the learners was three months, which represent the initial stage of a process that must be continued in order for the objectives achieved to be enduring. Therefore, the results of this work indicate that through environmental education it is possible not only to foster knowledge and respect for a given resource, but also to develop other skills, attitudes and values necessary during the educational process.

These results can be extrapolated to other contexts, since the educational method is applicable to the conservation of other resources in other geographical areas. As indicated above, the important thing is to focus on people, to build processes and not only disseminate information that can be forgotten without generating the expected changes.

According to Forero and Mahecha (2006), the fundamental epistemological basis of this work was that the action of environmental education was focused on the subject, in this case the students, and not on the resource to be conserved: the hicotea and its habitat. That is to say, we did not aim at a merely cognitive process of learning about the species, but at an integral process linking cognitive, attitudinal and participatory aspects. For its part, the pedagogical foundation was based on the constructivist current where the student was an important participant and actor in the learning process. According to this current, people construct their own knowledge based on personal and collective experiences. In this sense, constructivist postulates state that "human beings elaborate representations and conceptual, methodological and attitudinal structures" (Gallego, 2008), and adolescents as human beings, as stated by Ausubel, Driver and Vygotsky, acquire their own concepts of the natural phenomena of the external world (Ortiz, 2015)

In this way, it was of vital importance to evaluate the students' previous conceptions since, according to the constructivist current, the elaboration of knowledge is not achieved through a transmissive model, where the teacher passes the knowledge to the student, nor through an accumulative model, where a new concept is added to the previous ones. The student learns from what he already knows because he has an idea about everything that surrounds him (Giordan, 1998).

These conceptions must be reorganized by himself through discussions and argumentation. According to Giordan (1998) "the acquisition of knowledge proceeds from an activity of elaboration of a learner who confronts new information and his mobilized knowledge and produces new meanings more appropriate to answer the questions".

Finally, during the last stage, activities such as the elaboration of didactic material (brochures and booklets) were developed, which would later be used in socialization campaigns for the community in general (mainly for those people involved in the capture and/or commercialization of the species). A satisfaction survey was also applied to students and community members in order to evaluate the impact of the implemented strategy, obtaining favorable results in the perceptions of those surveyed and in their willingness to continue to expand the pedagogical strategy. With this initiative, it is clear that the success of wildlife conservation programs lies basically in the integration of biological, social and cultural aspects (Zapata et al., 2016).

As conclusions, it can be highlighted that the instrument designed showed to be specific and sensitive to evaluate the selected variables because it revealed a great lack of knowledge on the part of the students about aspects related to reproduction and morphological differentiation of the hicotea between males and females, which is quite common taking into account similar studies carried out with different taxonomic groups. Environmental education activities are fundamental to include communities in conservation and sustainable development processes (Trombulak et al., 2004). However, many efforts like this one are needed in Colombia to protect other seriously threatened species.

These actions are important because they can contribute to changing attitudes, raising awareness of the importance of species not only within the ecosystem but also in terms of the benefits they provide to local communities. In this way, a closer link can be established between society and nature. In this order of ideas, attitudinal and participatory changes are the beginning of a long-term process that must be continued in order to achieve the expected objectives. This integral environmental education project allowed students to acquire knowledge about the hicotea and its habitat through a formative process, but also aimed at the conservation of other natural resources.

The School Environmental Project proved to be a useful tool to link natural elements in education, in a less rigorous and imposed way, and in a more participatory way. In the same way, the outreach campaign appears as an appropriate strategy to disseminate knowledge about a certain resource, but it should be complementary to the educational process. The fact that people from the community, in this case students, participate in the dissemination process also favors the receptivity and participation of other members of the community in an educational or conservation project. In this order of ideas, the tools used (survey and workshops) turned out to be appropriate to make a first approach with the students and to characterize their knowledge, perceptions and actions about the species.

It is essential to continue developing strategies together with the local people and to involve other stakeholders such as environmental authorities and municipal, departmental and national governmental entities. It is also important to strengthen and expand environmental education strategies for both students and the community in general, in order to raise awareness among the local population and thus contribute to the conservation of this species and the natural resources of the region.

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