

Meaning of folk and artistic knowledge for education in biodiversity preservation

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ABSTRACT

The aim of this paper is to provide a theoretical background to the meaning of folk and artistic knowledge for education in biodiversity preservation, from natural and agricultural sciences, and its effect on teacher training in these specialties. The theoretical methods used helped set up the arguments presented. The significance of such knowledge in dealing with the contents of Biodiversity is supported, in order to offer significant knowledge with a personal sense, which can bring personal motivation and awareness concerning this natural resource, and the need for protection and sustainable use. It provides elucidation and productive creation of meanings in terms of biodiversity, that will lead to students' cultural improvements as future environmental educators. Folk and artistic knowledge is defined.

Key words: folk knowledge, artistic knowledge, education for preservation

INTRODUCTION

The study of biodiversity at different levels (genes, species, ecosystems) is a recurring and significant topic in the teaching-learning process of natural and agricultural sciences. However, during the process, it is important to make greater efforts in educating the present generations in preservation and sustainable use, as required by the National Strategy of Biological Diversity and Action Plan of the Republic of Cuba.

Biodiversity, result and continuity of the productive process is an essential part of the planet's composition; therefore "... *the earth's natural biological capital...*" (Capote, 2002 p.10). Its importance and the always present danger of reduction and extinction, puts pressure for new solutions that can stop the negative action of humans; its loss is one of the main environmental problems today. It must be addressed from different angles, especially education.

In that sense, it is important to optimize education for biodiversity preservation,

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also by training teachers. The knowledge acquired by students is insufficient during the process. Therefore, it is also necessary to introduce new teaching alternatives that offer motivation, awareness, and direction into permanent reflection to meaning elucidation. The aim is to promote positive behavior modes, to the extent of making sustainability a need.

It is possible when biodiversity studies are associated with culture, especially with folk and artistic knowledge, in which plants and animals are somehow present.

Various authors have referred to environmental and biodiverse education: González Gaudio (1997), Pellegrini, Álvarez, Moncada, Navas, Rávago and Rivero (2000), González (2003), Álvarez (2001 and 2003), Bynum and Porzecanski (2004), Brown (2008), Ulbrich, Settele, Benedict (eds) (2010), Gutiérrez and Bacardí (2010) and Méndez (2010), who in some cases refer to the meaning this topic has for traditional knowledge and practices. However, they do not go deeper, or deal with the importance of artistic knowledge regarding education in biodiversity preservation.

Cruz, Romero and Hernández (2007) and Hernández (2012) studied the relation between environmental education and culture. Méndez (2012) tackles the relationship between environment and culture, as well as its challenges for education, particularly to develop the individual's awareness for the environment. From that perspective, he ponders over the role of arts as an affective and formative component, due to the extent of knowledge and the values that it carries esthetically. But it fails to stress on meaning as a way to achieve education in biodiversity preservation, as a dimension of environmental education; it does not include the significance for folk culture, an issue mentioned by Guerra (2011, 2012).

Considering the importance of this topic, the development of this paper is intended to provide a theoretical foundation of folk and artistic knowledge for education in biodiversity preservation, in teacher training in natural and agricultural sciences, in Biology-Geography-Chemistry, and Chemistry and Agriculture.

DEVELOPMENT

Education for preservation and sustainable use of biodiversity is an important challenge for schools today, especially the Natural Sciences and Agriculture teacher (Guerra, 2011 and Mendez and Guerra, 2014). This situation urges teachers to find ways to ensure significant learning with personal awareness and positive feelings. Arguments related to this topic, as well as the meaning of artistic knowledge from the arts; and folk knowledge, as a component of folk and traditional knowledge, Declared by UNESCO (2003), as immaterial cultural heritage, are a melting pot of cultural diversity responsible for sustainable development. It includes uses, representations, expressions, knowledge and

techniques, instruments, objects, artifacts and inherent cultural spaces, recognized by communities, groups and individuals that are part of the cultural heritage.

Education for biodiversity preservation: theoretical reflections for development

The curricula and syllabus for different educational levels that address biodiversity call for treatment of contents and feelings of love and respect. However, the expected results not always match such aspirations, or are not as effective as demanded.

In that sense, some children, teenagers, and young adults have been observed to behave in detriment of biodiversity (they still chase lizards, and hunt birds to exhibit in cages, just to cite a couple of examples). Likewise, knowledge about this important resource is still limited, and the ways for sustainable use are unknown. Students receiving education as Natural Sciences teachers, also have cognitive and behavioral insufficiencies that limit adequate professional pedagogical and environmental performance, according to diagnostic studies made.

Because of the role of teachers in the teaching process, the target group chosen in this research was the training teachers. It does not mean that the results of the study are not applicable to other students in different educational levels. The aim is to offer significant learning with personal awareness about biodiversity, so the individual takes a leading part in providing solutions to problems that threaten biodiversity, as an expression of strong education for preservation, according to Guerra (2011).

Education for the preservation of biodiversity is a systematic process intended to develop knowledge, skills, behaviors, attitudes, feelings and behavior modes in the individuals.

According to Guerra (2011), this process must be developed on the basis of stronger features, such as the problematic character that urges students to face and solve opposing situations that generate doubts, queries, content search, and transformation of the reality associated with biodiversity.

It is also important to understand the interdisciplinary character that must sustain it, based on the integration of knowledge, far from disperse and fragmented studies.

Equally important is that it is based on the students cognitive and affective experiences in terms of biodiversity. The student's knowledge about daily life experiences, expectations and beliefs associated with its components, and the ones acquired through direct contact with them. All of it determines the formation of new knowledge and perceptions for preservation and sustainable use.

In that sense, this process must relate the cognitive and the affective, since student overexposure to scientific knowledge about biodiversity might risk the

affective side. On the contrary, it is important to hear about their experiences, feelings, interests, motivations, their inner world, etc., which in some cases work against the completion of the teacher's goals. The teacher will discover what students are more inclined to biodiversity; other students, however, express a feelings of hatred, fear, terror, aggression, annoyance or rejection, that may drive the individual to ill-fated behaviors toward preservation and sustainable management.

Education for preservation is also based on reflection and assessment, so the student can expand rational thinking over an intellectual activity that allows for analysis, synthesis, and the establishment of causal relations moving in the opposite direction to formal thinking. It is also a way to train logical thinking processes and offer favorable or unfavorable assessment of various situations, attitudes and tasks related to biodiversity.

Under such circumstances, a more communicative approach must be developed, which can guarantee dialogue, exchanges of viewpoints, and understanding of meanings, to project teacher training as an environmental communicator.

All this supports the idea of developing education for biodiversity preservation stripped from the traditional trends. Accordingly, the students will have an active part in the process, by acquiring knowledge and meanings associated to its components. A process guided by socialization, self-regulation and self-education in favor of this issue.

Moreover, to educate in terms of preservation, the Cuban school cannot put aside knowledge and traditions related to biodiversity. As part of the cultural heritage they have a critical effect, by conceiving the educational pathways that must be implemented to achieve sustainable behavior modes, and respect for all the components.

In that sense, "... *the existence of a special association between the Cuban people with nature, derived from myths, beliefs, legends and rites...*" in Estudio Nacional sobre la Diversidad Biológica en la República de Cuba (National Study on Biological Diversity in the Republic of Cuba) (Vales, Álvarez, Montes and Ávila, 1998, p.124), incorporated to the nation by ethnic groups that marked the nation's culture through "*transculturation*", have brought as much knowledge as the ones brought by the Cuban aboriginal mythology. They have remained in the history of some places in the country.

Likewise, Cuban biodiversity, especially animals and plants, have been an inspiration for several metaphors to express human feelings (positive or negative), so they are present in the oral traditions of music, the plastic arts, the theater and literature. None of it must be put aside when it comes to education for preservation and management.

In that sense, the school, as an official educational institution is nurtured from all the cultural heritage; it rescues the main values to develop the instructional

and educational work that corresponds, as a true exponent of culture and national identity, which strengthens its condition as the most important cultural center of the community.

Accordingly, one alternative is the association with other sciences that study biodiversity and its relation to culture in a wide range of instances. It is defined from a semiotic perspective, as "*... a process and result of human activity that confers socially significant meanings to the inner and outer human nature, in order to accomplish greater social progress; it is built, transmitted and preserved through complex sign systems* (Hernández, 2012, p. 5).

Biodiversity, as an object of study in Biology and other sciences is also part of culture. Accordingly, its knowledge is spread with the scientific advances; however, the gathered knowledge and experience must not be looked over from creative and practical activity.

As part of the contents included in official institutional education, it's based on a scientific conception that includes every aspect of culture outside the sciences, whose symbolical universe is so wide that it can contribute to solid knowledge acquisition by the individuals if treated pedagogically. In the eternal romance between man and science, and between lovers, there will always be a poetic load that will make that relationship more exciting, whether it is with stirring verses full of metaphors, or with the abstractions of the always loyal and proliferous lady named science (González and Ávila, 2005, p.109).

Reflections around such conceptions support the close relationship between education and culture. According to Guerra (2012), the individual acquires culture through education, transforms instincts into reason, systematizes theory, rediscovers and gives new meaning to the already known things, grows intellectually, and externalizes renovating concepts that bring different shades to culture, constantly denying the previous truth. In the same way, culture influences and transforms educational processes.

Culture's creative dynamism and communicative, socializing, interpretive, transformational and esthetic functions, achieved by interacting as a system when the surrounding world is understood (Atienzar 2008, p.68).

As an educational issue, the treatment of environmental education cannot be isolated from culture, because

... it is important to recognize the establishment of a symbiosis between culture and environmental education, in which the symbolic construction is the result of the social and educational process, which has a functional dimension of education, thanks to its capacity to create a regulating entity within the system of knowledge and ways to see the natural dimension of the environment in permanent interaction with society, in the framework of specific cultural contexts (Cruz, Romero, and Hernández, 2007, p.24).

From that perspective, it is important to look into the cultural meanings of

artistic knowledge and folk knowledge, to develop education for preservation and sustainable use of biodiversity.

Folk knowledge and artistic knowledge in education for biodiversity preservation

Guerra (2011) claims that education for biodiversity preservation has an essential premise: cultural appropriation of biodiversity content, based on significant learning, with a personal meaning. It is fundamental for the student to address the pedagogical process oriented to that end.

Accordingly, it is important to link the knowledge in biodiversity to folk knowledge and artistic knowledge, a triad that will bring greater cultural improvements to the students. All of them, in dialectic interaction, contribute with new meanings, and allow explaining and interpreting the issue of biodiversity, as well as the need for education in that direction, from a holistic and integrated perspective. It will have an effect on practical and pedagogic activities of the future teachers, and their transforming projection of themselves and the environment.

Biodiversity knowledge comprises the scientific contents of biodiversity that respond to the syllabus. Therefore, it includes knowledge, skills and values related to every component, and it is the starting point in that theoretical conception, because to preserve it and also educate in that direction, it is important to learn.

It offers all the knowledge gathered by science, especially the life sciences. Carefully selected, and according to the educational goals, they help students broaden their knowledge on different forms of life, from a scientific approach. Thus, it comprises geographic, chemical, ecological, ontogenic, anatomo-functional, genetic, systematic and evolutionary knowledge. They also identify and define their components at different levels expressed: genetic, specific, ecosystem.

Biodiversity knowledge is critical for the process; it is important to know about it, preserve it and give it sustainable use for the significance it has to the planet. Its treatment is focused on integrated knowledge, which is assessed in the different disciplines of the syllabus. From that perspective, biodiversity appears as a relevant issue that responds to a social need: the perpetuation of life in all its manifestations. It is studied thoroughly by disciplines and subjects in the degree, whose object of study and general goals are integrated by different components of biodiversity, which must be systematized by the other subjects.

It is knowledge that implies characterization of a taxon or ecosystem, the treatment of common and scientific nomenclature, taxonomic classification, mastery of technical vocabulary, the explanation of physiological, embryologic, genetic, ecological and adaptative processes, and their importance and experimentation. It also includes a system of categories that fundament the study of biodiversity, key concepts from fundamental ideas properly defined, which help

interpret associated phenomena and the need for preservation and sustainable use. Accordingly, the study of organisms in different taxonomic groups, will consider several concepts that support preservation praxis, as they provide meaning to species, either for being exclusive of the country, or for being located in a given threat category.

The student can then acquire the richness and representation offered by biodiversity at different biological levels, the dangers that be, and measures to preserve it. Furthermore, it helps develop intellectual, practical and professional skills that correspond, depending on their knowledge, and guarantee a consequent pedagogical behavior: knowing how to. Likewise, several values are developed and elucidated as an expression of how-to, based on standards, principles and convictions that give sense and direction to behavioral modes.

However, as mentioned above, biodiversity teaching and learning can be optimized and made more effective if it is associated to folk and artistic knowledge. A thorough analysis was made of culture, based on authorized criteria, by several authors, like Ortiz (1963, 1983), Sokolov (1988), Lotman (1979, 1994), Guadarrama and Pereliguin (1990), Álvarez (2003), and Read (2000).

In general terms, important fundamentals were elucidated, such as, culture as a cognoscitive and axiological system; as a dialogical process, highly communicative; having a multifunctional character that is preserved, transmitted and built from man-made, and natural signs, the noninherited culture that needs intended teaching-learning processes.

Moreover, aspects that characterize and define folk knowledge, as social knowledge, have been included. It also comprises the set of distinctive, spiritual, material, intellectual, and affective traits that characterize a society, or a social group in a given period. It is the fruit of collective awareness, which has been built through time, with a series of life experiences by the people.

Therefore, the importance of artistic knowledge is unquestionable to deal with biodiversity and its preservation; it represents the system of intellectual, affective, and procedural meanings, which create biodiversity referents from an esthetic and axiological function, using artistic messages. These referents are built, transmitted and preserved by formal supra-organizations from different artistic manifestations.

Folk knowledge is equally important; it represents the system of knowledge, ideas, assessments, traits (distinctive, spiritual and material), socially constructed, preserved and transmitted by means of traditions, myths, legends, beliefs, anecdotes, aphorisms and images that reveal the people's perception about meanings, relations, uses and modes of life associated with biodiversity.

A reflection on the knowledge provides better recognition of its importance to educate in biodiversity preservation. However, as a complement of the above mentioned, it is important to study this aspect further.

Art is an invaluable source of meanings to teach sciences and motivate its study. The arts and science have a dialectical bond that activates human thinking toward the search, understanding and interpretation of reality that surrounds the subject. This reflection has been used by different branches of scientific knowledge. The following comment about poetry says, "... *it is in the natural medium, the thought and form, because it is also a method to embalm essential ideas.*" González and Ávila, 2005, p.92).

Vygotsky (1989) claims that both poetry and art, in general, are one particular form of thought, which moves in the same direction as scientific knowledge does, but on different roads. From that perspective, Vygotsky (1989, p.50) states the following: "*Art differs from science only by the method used; that is, by the character of its life experiences; that is, psychologically.*"

Art carries knowledge; the artistic works bring to light the traits that distinguish a society, its costumes and traditions, the values and different uses given to the components of biodiversity, the incentive to further study it. The connotation is so strong it is considered a "... *form of precious knowledge for man, as the world of philosophy or science.*" (Read, 2007, p.43).

The roads used by the arts touch and effect on the most sensitive parts of individuals, their tastes and feelings. The messages carried may be conveniently used by the educator during the teaching-learning process, when the contents are related to biodiversity.

It is also important to stress that the artistic value of the arts allows students to perceive, from the biodiversity standpoint, the attributes and qualities of beauty and sublimeness over ugliness and tragedy. It happens when beauty, the dialectic variable of symmetry, harmony and detail, is perceived; an expression of life's complexity and diversity from a long evolutionary process, a reflection of the genetic variability or adaptative response to the environmental conditions. One important addition to it is the development of pleasant experiences and motivation, that will contribute with the student's implication in knowledge and preservation.

It can be useful to motivate the students to study taxonomical groups, arouse their interests and feelings, which are more stable, generalizing and lasting for decision making. The education and consolidation of feelings of love and respect for biodiversity guarantees the willingness to assume responsible attitudes toward preservation of biodiversity, and also feel committed to this natural heritage, whose main value is part of the Cuban and universal heritage.

Equally important is the axiological-ethical value. The behavior standards, basic principles, and national identity that must characterize man in society at any time, under several various conditions, may also provide artistic examples. Accordingly, when it shows anatomical or etiological details of a species (an endemic species whose extinction will not only affect the country, but also the world), raising awareness in the students is a priority, for example about that

endangered species, its preservation status, standards and measures to make it effective; as well as the need of sustainable use, especially if the species is included in some particular threat category, but most importantly, demonstrating the environmental responsibility of citizens.

Therefore, a formative value of artistic knowledge must be taught from the sciences, because it produces cultural growth in the future educators. It also stimulates learning, feelings and values, provided that "*...art creates images, appearances to represent ideas, and it shows the truth under sensitive forms.*" *It is necessary. It has the virtue of stirring the soul deep down, to make it taste the strongest pleasures bound to the vision and contemplation of beauty.*" (Hegel, 1974, p263).

Vygotsky (1989) strengthens that idea: "*... art represents the core of all biological processes of individuals living in society, a means to set up a balance between humans and the world in the most critical and responsible times in life*" (p. 299).

Regarding feelings, and following analysis of other philosophers' views, Vygotsky, (1989, p.299), an eminent psychologist, in his work *Psychology of the Arts*, claims that art is a sort of broadened social feeling, or feeling technique. He added that "*... feeling is primarily individual, but it then becomes social or is generalized, through a work of art.*"

Accordingly, socialization and individualization processes are determinant, as they promote reflections, and generalizations by means of communication and activities. The previous may have a positive effect on new meaning acquisition; it is a transit from the intersubjective to the intrasubjective, and vice versa. It occurs thanks to a meaning decoding process, internalization at the individual level, and it depends on the student's cognitive universe, life experiences, motives and needs. Through practice, these processes may lead subjects to significant personal acquisition of contents, which, in turn, will enhance their cosmo-vision on biodiversity.

Folk knowledge in terms of education, as compared with artistic knowledge, is closer to the subject, as long as he lives in society, in a given community, and has a family. His education and personal development is produced in a more direct interaction with such knowledge. Furthermore, as a result of folk and traditional culture, according to UNESCO (2002), it represents a whole of creations that respond to the expectations of a community, and is a reflection of its social and cultural identity; as well as in the creation, development and preservation of a nation's identity values.

As Velázquez (2002) noted, this knowledge, as part of the folk and traditional culture encompasses feelings and values that characterize a group whose collective life has survived through time, and has left historic marks. Thus, it is a determinant trait in teaching-learning processes.

Moreover, subjects not always have access to works of art. The interpretation of their meanings is associated to the cultural knowledge acquired, in which the family has played an important part, along with the school and society.

Folk knowledge that derives from beliefs, legends, myths, and traditions, are an expression of the kind of relations man has had with biodiversity along history. Knowledge is treasured as a result of practical experiences, sometimes so sensible that they conclude with a scientific result. So "*... it (experience) can be known and assessed not only from a scientific position, but also from the elder's wisdom and cumulated knowledge, from aborigines, fishermen and farmers...*" (Álvarez, 2003, p. 2).

The knowledge and values carried by the popular wisdom are varied. Only by reflecting on the fact that it is part of gathered knowledge, from millenary experiences lived in terms of management and use of biodiversity, nutrition, home construction, furnishing, medication, agriculture, fishing, etc. Many were based on observations of natural phenomena. They offer educators many choices to teach from a process that favors sustainable development, to make better use of natural resources and survival.

Much of the content present in the folk knowledge has a strong load of feelings related to the defense of nature, based on empirical but true standpoints. The attachment to the land and its resources, the particular way to prepare foods, crop harvesting at the right time, the growing techniques and soil use, show the education they have.

Folk knowledge and artistic knowledge embody gathered knowledge, meanings, values, traditions, and cultural practices. Knowledge about biodiversity in the folk and traditional culture, and in the arts lead to a productive creation of meanings and personal sense in terms of biodiversity, when debate and reflection are held from the natural sciences, in dialectic interaction with scientific knowledge. All of it enhances the students' culture as future educators.

Knowledge in biodiversity is integrated to all the other knowledge, so mutual complementation takes place. It tells of the improvement and contextualization of biodiversity contents in the instructional, educational and developing processes. On one hand, knowledge based on scientific biodiversity contents facilitates comprehension, explanation and interpretation of processes and phenomena associated, especially those with a false or limited interpretation in folk knowledge or in the artistic knowledge. On the other hand, scientific knowledge takes and is transformed in a new perspective that gives values to perceptions, cosmo-visions, and knowledge about biodiversity. They acquire certain value, and are present in that knowledge.

The integration of artistic knowledge and folk knowledge as cultural heritage in biodiversity allows for making good use of the positive side contributed with. It also allows working on the negative side that hinders and halts preservation; debating on its veracity and scientific foundation in search for re-interpretation

of theoretical knowledge that will have an effect on the quality of perceptions, representations and judgments from students, in a scientific conception of the world that can properly direct the transforming activity. No doubt it will make a change in their values.

So it is important to make analysis of beliefs, myths and legends about the components of biodiversity, to reaffirm or change meanings when they carry mistaken or mythical interpretations, or both, about adaptation and behavior of certain species. Feijoo's (1986) reflections are present today, when he says that mythology comes from the people's imagination, their longings and dreams, superstitions and fears, apart from being original and symbolic. He also notes they are valuable oral documents of the people.

Salvador Bueno, in the preface of the book *Leyendas cubanas*, claims that the legends and myths help elucidate the causes of events that have no easy explanation; and he adds that together with the traditional children stories, they can arouse positive ethical values.

A similar situation is presented in the arts, particularly in literature, carrying symbolic constructions of biodiversity with new meanings, explicitly or implicitly, which can contribute or not to providing connotations and develop favorable feelings. In that sense, Hernández (2012) noted that the symbol is characterized through a concrete element, judgment, concept, and idea, relying on a socially accepted conformity.

These considerations are based on dialectics, since integrating such knowledge implies a process that favors the negation of previous truths, reconceptualization, and improvement of arguments that makes biodiversity preservation significant for the subjects to foster environmental transformation into a new quality within the teacher's professional performance, as an educator for preservation.

Folk knowledge and art are information sources about biodiversity and human relations along history with particular importance. Valuable information about about the benefits, damages and uses of endangered or extinct species from the biota may also be passed on.

There is coincidence with Fuentes (2010) when he notes that information also contributes to rescuing and preventing the loss of traditional knowledge about properties, use and management of biodiversity by human groups, which may be valuable to agriculture, medicine, industry, economy, and therefore, a reason that supports its significance from education.

A lot of "the scientific knowledge" has been produced or reset from traditional or local knowledge. The knowledge systems in every culture comprise linguistic, botanical, zoological, traditional, and agricultural aspects from the interaction of individuals and the environment, and passed on verbally, from generations to generations. (p. 4)

In either case, the teachers to be will have to acquire that knowledge to project

their practical-pedagogical activity, so the educational and instructional message carries proper sense and meaning. The educator's environmental training must include that particular; it demands implication in the community and familiarization with their socio-cultural and economic characteristics, from the problematic situation, scientific search and enquiry, as well as the necessary assessment values, to work as an environmental promoter of biodiversity preservation. Then, granting importance to folk knowledge in the formative process will bring meaning to the dynamics of a community and the arts.

The acquisition of that knowledge will also make possible the inclusion of a new argument when it comes to the relevance of biodiversity, by revealing its meaning in culture. It will dignify biodiversity as a natural heritage of great value, not only to meet primary and economic needs of humans, or its role in nature, but also for being present in the memory of the cultural heritage, and for what it stands in humans' affective lives to create a set of balanced values. There will also be greater attachment to and identification with the community, to strengthen the cultural identity of subjects, to give it new meaning as a representative component and element of nationality and culture.

In Natural Sciences education, this knowledge stems from the dialectic interrelation of the basic cultural roles that favor acquisition of biodiverse contents, by offering a perception that reverts ultimate mastery of free-will satisfaction of needs, to one based on respect and sustainability, produced by reliable cultural patterns. It is the transformation of man into behavioral modes based on commitment and responsibility, with a futuristic vision of new environmental management forms.

The above calls for interdisciplinary strengthening in order to stimulate an approach of a natural sciences and agricultural area to the humanities, in terms of content treatment, and teaching aids, using cultural icons. Thus, the training of students in these specialties will be more integrated.

One significant alternative to ensure that is the inclusion of ethno-biological aspects in the educational process. Ethnobiology is an object of study in biological sciences (Moreno, 2000, Escobar, 2002, Enríquez, 2007, Fuentes, 2000, 2010). It is giving meaning in community works intended to preserve biodiversity. However, it has not been totally used in pedagogy to urge students to further study human-society relations with biodiversity. More studies could be made on different uses of biodiversity, and the significance it has had in different cultures, as a way to strengthen its values and identity with the community's natural and cultural heritage.

Guerra (2011) proposed to integrate the ethnobiological approach in Natural Sciences education, from which the study of biodiversity is redirected, putting emphasis on its relationship with culture, and giving priority to different beliefs, uses, and management that several ethnic groups have done with its components thinking of the benefits of biodiversity education. All of it may have a positive

impact from the educational standpoint.

The thoughts derived from these views consider the integration of the above knowledge as significant, because they contribute with education for biodiversity preservation.

Below are some examples of teaching tasks that can serve as patterns for teachers in their practice.

Example 1

Read the following fragment of the poem Niagara, written by Cuban poet José María Heredia (1803-1839), include in the Spanish-Literature Student Book of Eleventh Grade.

*Más ¿qué en ti busca mi anhelante vista
Con inútil afán? ¿Por qué no miro
Alrededor de tu caverna inmensa
Las palmas ¡ay! Las palmas deliciosas,
Que en las llanuras de mi ardiente patria
Nacen al sol de la sonrisa, y crecen,
Y al soplo de las brisas del Océano,
Bajo un cielo purísimo se mecen?
Este recuerdo a mi pesar me viene...
Nada ¡oh Niágara! Falta a tu destino,
Ni otra corona que el agreste pino
A tu terrible majestad conviene
La palma, y mirto, y delicada rosa,
Muelle placer inspira y ocio blando
En frívolo jardín: a ti la suerte
Guardó más digno objeto, más sublime.*

- What meaning does the poet give to palms?
- What kind of feeling is expressed in this poem? What do you think about it?
- What is the basis of this question?: *¿Qué en ti busca mi anhelante vista
Con inútil afán?*
- Read this riddle by Rafaela Chacón Nardi.

Crezco en montes y llanuras

*De esta, en mi tierra insular.
Con amor, en nuestro escudo
me supieron dibujar.
Y aunque es su nombre muy noble,
soy un árbol popular
que las casas campesinas
con gusto voy a techar.*

- e) What is the common idea expressed in the riddle and the stanzas of the poem?
- f) What kind of palm tree do you think the author makes reference to?
- g) If the Cuban Royal Palm is not an endemic Cuban tree, why is it a symbol of our nationality?
- h) Is it the only species of the Arecaceae family present in Cuba? Provide other examples of Cuban palm trees and talk about their importance.
- i) Do research on the most commonly found plants that inhabit the two locations: the physical location, and the poet's yearn. From the data collected, provide some interpretation of the sense in the first six verses of the second stanza.
- j) Is the pine represented in Cuban flora? Determine its endemism, preservation state and importance.
- k) Why is the preservation of these and other Cuban trees important?
- l) Design an educational project that contributes to preservation and propagation of Cuban trees based on the implication of community and school members.

In this case, a feeling of Cuban identity expressed by the authors is observed from a literary position. It can be a good example to educate in biodiversity preservation and integrate education of values. This activity can help the educator motivate the search for more information about the Arecaceae family and its importance.

Example 2

Over the study of diversity and importance of birds we mentioned some examples of Cuban birds, like the Cuban trogon, the mockingbird, the hummingbird, and others. Nicolás Guillén makes an allusion of one of them in the following poem.

¿De qué metal está hecho
Ese broche, ese temblor,
Para prenderse en qué pecho

Como un alfiler de amor?
¿Y en qué pluma se viste
Ese broche, ese temblor
Para quien la flor existe
como una copa de amor?
¿En qué sueño aún no soñado
Ese broche, ese temblor,
Es suave guerrero armado
con una espada de amor?
¡De qué modo, cómo hiciera
De ese broche, ese temblor,
Un fijo broche que ardiera
en la blusa de mi amor !

- a) Which of the birds mentioned above did the author make reference of? If you have doubts, answer the following questions.
- b) What association can be established among these words? metal-pin-sword, in association with size, shape, color.
- c) What animals could feed from that flower? Why?
- d) Can you identify the animal that inspired the poet? What is it?
- e) What other feature of the animal can you associate with a brooch? Why?
- f) What effect is achieved by the poet when he repeats **ese temblor** in all the stanzas?
- g) What is the main idea suggested by the poet?
- e) Why is preservation of the species so important?
- f) Cite two measures for its preservation.

The positive meaning that the hummingbird has for the author is evident, for the beauty of its colors, and its behavior. He ennobles the qualities that make it relevant to offer it as a symbol of love. In the poem, metaphorically, there are allusions to characteristics and behaviors of the species, which may be used by the teacher to gather more information on the Cuban endemic feature of the bird, and persuade the students of the need for its preservation.

Example 3

Take a look at this lithography entitled *Plantas Tropicales*, by Pablo Picasso (1881-1973). It shows a group of plants, including the so-called carnivore plants.

- A) What features are specific of the Plantae kingdom?
- B) Among the plants an insect is flying. What do you think the author suggests? Illustrate your answer.
- C) Are carnivore plants really dangerous as shown in legends and myths? Illustrate your answer.
- D) Investigate on the presence of carnivore plants in Cuba, and especially in the province of Camaguey.
- E) Design a teaching task with a reflexive approach that allows you, from a belief or myth, educate in the preservation of this group of plants.

In this example, some carnivore plants are dealt with. These plants have been object of unfavorable beliefs, legends, and myths. Therefore, the homework assignment and self-preparation may help clear up doubts, reach theoretical knowledge for better understanding of this plant's adaptation and importance. This example reveals an alternative to integrate art in the Natural Sciences class, with all the knowledge it takes.

Example 4

Read the following stanza of the poem *Al pueblo de Camaguey*, written by Juan C. Nápoles Fajardo, in 1854, very carefully.

Yo adoro de mi patria esplendorosa
El suelo fértil, tropical y lindo,
Como adora la cándida tojosa
La rama horizontal del tamarindo.
Cuando el cansancio sin piedad me acosa,
Y a descansar bajo el anón me rindo,
Oigo el tosco cantar del tocororo
Y alegre canto a la mujer que adoro.

- A) Place the organisms taxonomically named by the poet and explain.
- B) Define which of them are endemic, autochthonous, introduced, and non-aboriginal (cultivated or added).
- C) Which of the species mentioned have aboriginal names and are part of the nutritional traditions of the Cuban population?
- D) What meaning is attributed to gray doves? What do you think about it?
- E) Explain the actions that can be threats to the mentioned organisms, and refer to the possible measures for preservation.

- F) Investigate the different uses and cultural practices included in the Cuban folk and traditional culture with the species mentioned. Design a teaching activity with the resulting elements of your research.

As can be seen, this example shows the integration of the ethnobiological approach in the Natural and Agricultural Sciences, in the teaching-learning process. In the poem's stanza information is given on plants and animals that can be observed in the Cuban fields. Besides, the teacher can stimulate a search for feeding traditions of the Cuban population, and different uses and cultural practices performed to the plant species mentioned. Obviously, folk knowledge strengthens the lesson, with the power granted by the folk and traditional Cuban culture, and the development of a general integrated culture in the students.

CONCLUSIONS

- Folk knowledge and artistic knowledge are significant tools to educate in biodiversity preservation, from the cognitive and motivational-affective sides, which contribute to significant education when they are closely associated.
- The dialectic interrelation between biodiversity knowledge and the folk and artistic knowledge may help increase student motivation to study, and cognitive enhancement, by integrating meanings, providing new meanings, and discovering others. It will have an effect on personal learning, a necessary premise for education in biodiversity education, and future environmental pedagogical professional performance.

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