

# BIOCENTRIC REASONING IN CHILDREN: IMPLICATIONS IN SCIENCE AND ENVIRONMENTAL EDUCATION

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*Abstract:* This study aimed to verify the incidence of biocentric reasoning (centred on the welfare of the animals) in 91 children, aged between 8 and 10, attending the 3<sup>rd</sup> and 4<sup>th</sup> years in a primary school of Lisbon, Portugal, and is the continuity of another study promoted by the authors. To do that, a questionnaire was applied, inquiring about the type of places where the children contact with animals and their opinion about the human behaviour in three different situations involving animals (dilemmas). The results have shown that the majority of children had a small contact with natural and semi-natural places, and the majority only went to places where nature is managed, like zoos and similar parks. This experience seems to be responsible for inappropriate ideas about zoos, considered by some children the ideal place to keep wild animals because there they are well treated and safer from predators. However, and globally, the incidence of biocentric reasoning in the dilemmas is high, proving its increasing in situations in which human action is considered selfish or inappropriate, but it also is affected by the species presented (the empathy factor seems to be important as well). Implications of these results for Science and Environmental Education are also discussed.

*Keywords:* Children-animals relationship; Ecological dilemmas; Anthropocentric reasoning; Biocentric reasoning; Ecocentric reasoning

## FRAMEWORK

The interest for environmental issues in the last decades conducted to the affirmation of the environmental ethics field, where different theoretical works in the way Human-Nature relationship is conceived can be found. In a simple categorisation, these works can be inserted in one of the following perspectives: (1) Anthropocentric – centred on an instrumental vision of nature and defending the sustainable use of earth resources. However, it can also emphasise the contribution of nature to the integral development of the human being in both physical and psychological terms; (2) Biocentric – centred on the intrinsic value of the other beings, with a strong opposition to multiple ways of their exploitation. Because it includes different approaches, it can be limited or confined to the more complex creatures (mammals and birds) or extend the moral consideration to all life forms; (3) Ecocentric – centred on the intrinsic value of ecosystems, whose equilibrium is more important than the particular interests of each species, including the human. It can also emphasise a deeper connection between humans and nature where aggressions towards nature are seen as aggressions towards our species.

In another context, environmental issues also entered the curricula of different countries, in association, specially, with Science Education and Environmental Education. However, in the case of Portugal, the dominant pragmatic view has conducted to the implementation of activities considered apparently neutral and consensual, not reflecting the rhetorical diversity found in the environmental ethics field, and only implicitly transmitting an anthropocentric perspective of nature (Cachapuz et al., 2002; Almeida, 2007). The excessive focus of teachers' environmental projects on resources management, drawing attention to simple actions like recycling, buying environment-friendly products, saving water or switching off

the lights when one leaves a room or on the improvement of the quality of school areas can be explanations for this situation (Almeida & Vasconcelos, 2011).

## **RATIONALE**

Beyond the field of environmental ethics, the domain of Developmental Psychology has also been interested in the incidence of anthropocentric and biocentric reasoning in children and adolescents. Studies by Kahn (1999, 2002) employed an interview methodology including questions about children's knowledge, beliefs and values related with environmental problems and applied it to three different regions of the world – Houston (USA), Amazon (Brazil) and Lisbon (Portugal). The results were very similar and revealed a low incidence of biocentric reasoning that tends to increase with age and can coexist, in some cases, with anthropocentric reasoning, reflecting a broadening of the mental organisational structure of the human-being. Kahn also found a type of biocentric reasoning, designated compositional reasoning that reflects a more holistic view of the environment because it is based on the integrity, beauty and sense of balance of nature. Compositional reasoning, a kind of ecocentric reasoning, clearly increases with age, especially in adolescence, and seems to depend on a deeper understanding of ecological concepts.

Trying to explain these results, Lourenço (2006) considered that the cognitive potentialities of reasoning not centred on the human beings are not being explored by school. But Kellert (2005) referred a new trend in the modern world, of which, in fact, we don't know the exact implications: the direct experience in natural and semi-natural places is declining and being substituted by an indirect experience in places where nature is managed by the human-being, such as zoos, aquariums and other similar places. However, a different approach can be found in a study promoted by Kortemkamp & Moore (2009). They concluded that the incidence of biocentric reasoning can be related with the way questions are formulated. Children, when confronted with situations where human action is considered selfish or unfair, improved significantly this way of thinking.

In face of very different results, Almeida et al. (2011) promoted a study with urban children (ages 8 to 10), using an interview methodology, confronting them with one real and two hypothetical dilemmas involving animals, and also wanting to know the type of places where they had already met animals. The real dilemma was about the slaughtering of seals because they included codfish in their nourishment; the hypothetical ones were about the capture of a hedgehog and a small fox in the wild carried into a backyard in an urban environment. This type of questions generated high biocentric reasoning, even considering that the contact experience with animals occurs mainly in places where nature is managed. However, the fact that some children argued referring their empathy for seals, seeing them as friendly animals, and that, at the same time, some others referred the danger for humans of capturing a young fox (which are both anthropocentric arguments), conducted to the new/complementary study now presented.

## **Methods**

To verify, once again, if biocentric reasoning is affected by the way of questioning but also by the animal species in presence, a new but similar questionnaire was built, with a few changes in the species presented in the dilemmas. Table 1 contains the questions used in the questionnaire and also their nature.

Table 1. Interview questions and their nature

Number	Question	Nature of the question
1	Can you tell me places where you have met animals in freedom?	Question about experiential aspects of the child
2	Can you tell me places where you have met animals in slavery?	Question about experiential aspects of the child
3	From all the mentioned places, which one did you like the most? Why?	Question about child's beliefs
4	From all the mentioned places, which one did offer the best conditions for animals? Why?	Question about child's beliefs
5	The amount of codfish in oceans is decreasing. Some scientists discovered that some shark species eat this fish. To prevent the continuous decreasing of codfish we are thinking in a way of killing a higher number of sharks. Do you think it is a right or a wrong decision? Why? If for you it is a wrong decision, what other measure would you take?	Ecological dilemma in relation to a real scenario
6	A family went for a walk in a forest and found a tortoise. One of the members caught it and brought it to their backyard. Do you think it was a right or a wrong decision? Why?.	Ecological dilemma in relation to a hypothetical scenario
7	A family went for a walk in a mountain and found a young wolf. One of the members caught it and brought it to their backyard. Do you think it was a right or a wrong decision? Why?	Ecological dilemma in relation to a hypothetical scenario

In this new questionnaire, the seal was substituted by the shark (a less friendly animal), the hedgehog by a tortoise (a less complex animal) and the young fox by a young wolf (a hypothetically more dangerous animal). The questionnaire was piloted first with 6 children and then applied to a sample of 91 children (ages between 8 and 10), attending the 3<sup>rd</sup> and the 4<sup>th</sup> years in a primary school of Lisbon, Portugal. It was a convenience sample, like the one in the previous study cited, improved by the authors, because it was formed by pupils of 5 teachers that usually collaborate with initial training courses for new primary teachers. All the questionnaires were applied by the same researcher in each class and started with the explanation of its purpose, knowing their opinion about certain issues, and emphasizing that there would be no right answers. Then, each question was read aloud by the researcher, and a time was given to each child to answer it; only after that, the next question would be proposed. We tried to avoid answers impossible to codify due a misunderstanding of the questions. The answers were codified as anthropocentric - if centred on any benefit for the human-being (children include); biocentric – if centred on the interest of other living beings, and ecocentric – if it appealed, even subtly, to holistic relationships between natural entities. We decided to include ecocentric reasoning, excluded in other studies, even knowing that probably it will have a small expression, considering that it depends on the comprehension of ecological concepts, which normally occurs in adolescence. Some examples of examples gave by the children were included not only for a better understanding of their codification but also to show the diversity of the ideas propose by the children. In the transcription of their answers, Seidman's (1998) recommendation was followed, as he considers that, to preserve

the dignity of the participants of a study, some orthographic and semantic corrections must be included.

The percentage of each type of answer was compared with the one obtained in the previous study and in the presence of dissimilar results a chi-squared test ( $\chi^2$ —non-parametric statistics) was used with a 0.01 level of significance to verify the homogeneity between the two samples.

## RESULTS

The results confirm the lack of contact of urban children with natural and semi-natural places, with more expression in this study, considering the number of children that didn't remember seeing animals in the wild. Even so, the incidence of biocentric reasoning was still high but influenced by the focus of the questions, as answers to questions 3 and 4 are a good example. In the first one, when expressing their preference for places where they had seen animals, anthropocentric reasoning was dominant, with arguments about the quantity of animals seen, the fun they had, or emphasizing the fact they saw their favourite animal; in the second one, when invited to assess the animal conditions in the places referred, the tendency inverted and biocentric reasoning was almost exclusive, with considerations about the value of freedom, being in their habitat and having food, good treatment conditions or being protected from predators when in captivity, especially when zoos were referred. In fact, this last argument shows that for some children zoos conditions are even better than those in the wild, undervaluing the authenticity of the places as a criterion for animal welfare.

Considering the three dilemmas proposed, biocentric reasoning was again the most frequent as in the previous study. In the case of the shark dilemma, the highest number of the children criticized the killing of sharks. They didn't agree for different reasons like the following: -They are killing a fantastic species; -...because they are living beings; -It is not fair to kill them and keep all the cod for us or -...because all animals have the right to live. Some reasons even reveal, in some way, embryo ecocentric ideas: -sharks are important in nature or -...because without sharks, cleaner fish don't have any work to do. However, comparing with the first study where a seal was used in the dilemma instead of a shark, biocentric reasoning has less expression. The use of the chi-square test revealed statistically significant differences between the two samples ( $p < 0.01$ ), which proves the importance of the empathy factor in this type of reasoning. Even so, the majority of children that disagreed with the sharks slaughtering gave biocentric alternative solutions. Some examples: -I think that fishermen should fish less. In fact, they are not helping to deal with the situation; -We should not kill sharks and eat more vegetables and fruits instead, which is healthier or -I propose to reduce cod fishing and then cod can reproduce and we can fish it again. Even so, a few creative anthropocentric solutions were suggested: -My solution would be to put sharks in a zoo or -I think we should give them something to make sharks fall asleep and then fish the cod.

Considering now the two other dilemmas, the change from the hedgehog to the tortoise and from the young fox to the young wolf didn't affect the biocentric incidence of the answers. In the first case, most children considered a wrong decision to catch the tortoise from the forest. Some arguments were: -...because the tortoise was at its natural habitat; -The tortoise will be sad because it doesn't feel at home and in freedom or -...because it will lose its family. Even those children that agreed with the action revealed they were worried with the animal welfare: -it was a good decision because a car or a truck could run over it or -they did right because in a backyard there are many leaves for the tortoise to eat. In the second case, the arguments were similar but with a high incidence on the importance of keeping the young wolf with its parents/mother, when comparing with the tortoise dilemma. Some examples of the different reasons given by the children: -they did wrong because animals have the right to

be free; –it was a bad decision because the wolf is a baby and needs its mother’s care; –they did wrong because young wolves must be near their parents and mountains are the place where they should live or –...because wolves are wild animals. However, like in the dilemma with the young fox presented in the previous study, the danger factor had similar expression, emphasizing the problems to humans caused, for instance, by the growth of the young wolf. Some examples: –they did wrong because the wolf can attack when it grows up; –the wolf can kill someone and it bites or –wolves kill people and eat chickens.

## **CONCLUSIONS AND IMPLICATIONS**

The results of the two studies promoted show that the majority of children in the final years of primary school<sup>1</sup> can reason in a biocentric way and a few also reveal some perception of the holistic function of nature. That allows peers discussions to its promotion in those that can only argue in an anthropocentric way. Considering this, and other results presented, a systematisation of some implications for Science and Environmental Education is possible:

-To promote outdoor activities in very different places (natural e semi-natural).

It’s important to increase the diversity of places where children can contact with animals. Because their experience seems limited to places where nature is managed, like zoos and similar parks, the contact with natural parks and reserves is an important complement, especially because it promotes the fortuitous contact with animals, helping children to recognize that this type of experiences has a much higher value than the contact with animals in cages or small places where no effort is made to see them.

-To discuss, in particular, the zoos conditions, and those of similar places, for a better understanding of the relation between animal welfare and the authenticity of these places; This recommendation is related with the previous one. It is also important that teachers explore zoos, not only in a scientific dimension but also in an ethical one.

-To diversify the issues in classroom, including some controversial ones that deal with human-animal-nature relationship, like sportive hunting, human-diet and species extinction, for instance.

In fact, because children can understand non-human centred arguments, the confrontation of different ideas and perspectives about these subjects can promote an important cognitive development of students and a better understanding of the cultural, social, economical and ethical dimensions that they include.

-To discuss pets, domestic and wild animals’ specificities for a better understanding of the needs of each group;

It’s important to explore the real needs of the animals from the groups mentioned above. In fact, some misconceptions were detected in the children’s ideas, and these may be related with the limited contact with places where nature is managed.

-To approach the ecological role of each species, independently from complexity, aesthetics and empathy, which can help to overcome the bad reputation of several animals due to superstitions or legends, often making them victims of irrational human behaviour.

Some children revealed some exaggerated perceptions about the real danger of some species, particularly those with a predatory instinct. Therefore, some work must be done towards a better understanding of the behaviour of these species, making their danger for humans more relative.

## **NOTES**

1. Primary School in Portugal includes the first four years of Basic School. The ages of children are, normally, between 6 to 10.

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