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Introduction

General patterns which portray the mode in which cognitive and moral development of the human being is processed, proposed by Jean Piaget (2001) and developed by Laurence Kohlberg (1981), may be encapsulated as follows: each child gradually leaves behind an egocentric way of thinking and acting as he/she acquires the ability to stand outside himself/herself in the course of interactions established with others. This ability leads to a growing concern with the needs of others and an understanding that, in the common interest, it may be necessary to put aside personal whims and desires.

Concern with others is often understood in a restrictive way, since it is confined to human beings. This reflects one of the anthropocentric dimensions about nature and its constituents, which is valued according to its multiple utility for the human being (for recreation, health, aesthetics, resources). However, the perception about the needs of others, or about the conditions necessary for their growth and/or integrity, can be extended to non-human entities and be defended for non-instrumental motives.

The current environmental crisis has no doubt contributed to this perception, due to the awareness of the negative effects of many human interactions with other living creatures and the ecosystems themselves, and increased the theoretical production in the environmental ethics field where distinct philosophical approaches to the conceptualisation of the human-nature relationship emerged. Biocentric theories such as those from Peter Singer (1990), Tom Regan (1983) or Paul Taylor (1989) argue for the intrinsic value of other forms of life, regardless of their relevance to the human species. Singer emphasizes the suffering of animals in animal production and scientific

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3 investigation. Regan appeals to the rights of animals capable of having desires and aims
4 with a psychophysical identity over time. Taylor prefers not to identify the specificities
5 of complex animals as important and extend the moral consideration to all life.
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10 Also, ecocentric theories such as those of Baird Callicott (1989), Holmes Rolston III
11 (1994) or Arne Naess (1989) endorse a non-instrumental value of the ecosystems and
12 the ecosphere itself, the equilibrium of which can impose limits on particular human
13 activities. Callicott gives importance to the interconnected view between humans and
14 nature of Indian societies. Rolston's belief is centered on the idea that value can exist in
15 nature, independent of human evaluations. Naess posits that Self-realization of human
16 beings is only possible with a strong connection to nature.
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29 The incidence of non anthropocentric reasoning –previous studies

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31 Authors working in the field of developmental psychology and more in line with Piaget
32 and Kohlberg have been showing increasing interest in ways of thinking not centred on
33 the human beings, according to age or factors that can accentuate or inhibit them.
34 Studies by Kahn (1999, 2002), based on interviews, aimed exactly at confronting the
35 incidence of anthropocentric and biocentric reasoning in children and adolescents in
36 three different regions of the world – Houston (USA), Amazon (Brazil) and Lisbon
37 (Portugal) - when questioned about the seriousness of a variety of environmental
38 problems. The geographic diversification of the samples enabled him to verify whether
39 cultural context is of paramount importance in that reasoning. For instance, one could
40 expect a more biocentric form of reasoning in children from the Amazon, due to their
41 closer and more intense relationship with nature.
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57 The first two studies involved children up to ten and showed a higher frequency of
58 anthropocentric reasoning connected to the dangers occurring from negative action of
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3 humans upon ecosystems, though some biocentric reasoning could also be detected,
4
5 albeit at a reduced rate. The Lisbon study involved participants aged 10, 13, 16 and 19,
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7 and thereby allowed for a better comparison of frequency of reasoning not centred on
8
9 the human being according to age (Kahn and Lourenço, 2002). In fact, results showed
10
11 that biocentric reasoning increased with age, although without majority or exclusiveness
12
13 and always following an incoherent pattern. As Kahn (2002) explains, with the onset of
14
15 adulthood, both ways of reasoning coexist and reflect a broader mental organizational
16
17 structure which sets the frame work for a broader understanding of the inclusion of
18
19 human beings in nature.
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24 One of the forms that the author considers as biocentric reasoning (and which he deems
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26 compositional because it is based on integrity, beauty, harmony or proportion of the
27
28 whole and the parts), increases considerably with age. Also, due to its holistic nature it
29
30 seems to represent at least a first approach to ecocentric thinking. It should be said that
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32 the late emergence of compositional reasoning is (according to Kahn) due to late
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34 comprehension of ecological concepts, which he considers to effectively occur (i.e.
35
36 occur with obvious effect) in adolescence.
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41 In a nutshell, the three studies carried out in different contexts showed a low frequency
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43 of biocentric reasoning in comparative terms, although the choice of topics in which the
44
45 subjects were questioned influenced the relative frequency of the two kinds of reasoning
46
47 under discussion. For instance, in one of the studies by Kahn (1997), biocentric
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49 reasoning was more frequent when children spoke about the negative effects of an oil
50
51 spill on marine life than when they talked about the effect of the oil spill on the shore
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53 line.
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57 There are several possible explanations for the low frequency of biocentric reasoning,
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59 even among the older subjects. Lourenço (2006), one of the researchers in the Lisbon
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3 study, suggests that such results may be due to a frequent exposure at school to an
4
5 excessively instrumental view of nature, to the detriment of other perspectives. Even in
6
7 schools involved in environmental education projects, this perspective prevails over the
8
9 others and the sustainability discourse is subordinate to emphasis on the welfare of
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11 future generations of the human being. The cognitive potentialities of reasoning not
12
13 centred on the human being for the overall development of young people thus seem to
14
15 be completely forgotten.
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19 This justification, if accepted as generally true, suggests that the recommendation of
20
21 Wilson (1993) that one of the main objectives of environmental education is
22
23 establishing a sense of respect for all living and nonliving elements of the natural world
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25 remains to be fulfilled. Furthermore, the appeal by Lijmbach et al. (2002) and Mortari
26
27 (2004) for the creation (in formal learning contexts) of discussions that allow for the
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29 recognition of different ways of understanding the relationship between human beings
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31 and nature remains as yet unfulfilled.
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35 However, the school often reflects the same way of thinking as society at large. These
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37 ideas establish themselves both implicitly and explicitly in formal learning contexts, but
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39 they also determine the process of socialization of children in other contexts. Thus, the
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41 low incidence of reasoning not centred on the human being may result from the
42
43 influence of a prevailing social paradigm of an anthropocentric nature which has
44
45 become ingrained since the industrial revolution. This paradigm can be characterized as
46
47 follows: humanity has been freeing itself from many of the constraints to which it has
48
49 been subject, due to scientific and technological development - this has led to the idea of
50
51 unlimited progress and a higher consideration of the human being. Nevertheless, this
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53 has also led to the present environmental crisis, owing to the several unsustainable ways
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55 of exploiting nature that have been implemented.
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3 However in recent decades, theories not centred on the human being (such as those
4 previously cited) diverge from this paradigm, which has been considered dominant.
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8 Franklin (2008) even refers to a recent change of paradigm. And he explains: during
9
10 part of the 20th century, “animal exploitation, extinction and experimentation were the
11 prices to pay for the great human good” (p.35). However, in the final part of the 20th
12
13 century, we can see the growth of the politicization of human-animal relations in the
14
15 Western world with changes in the philosophy of zoos, food diets (showing a decrease
16
17 in meat consumption) and a new attitude questioning the habit of keeping caged birds or
18
19 intensive animal production.
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24 A study by Lima and Guerra (2004) establishes a contrastive analysis of two paradigms:
25
26 the aforementioned Dominant Social Paradigm (anthropocentric) versus the New
27
28 Ecological Paradigm (non-anthropocentric), and reveals how the Portuguese subscribe
29
30 to this new paradigm. To this end, the authors applied the NEP (New Environmental
31
32 Paradigm) scale conceived by Dunlap et al. (2000) that consists of 15 statements about
33
34 which the participants are asked to express their degree of agreement, often used in
35
36 research procedures in the US (United States). Results do not support the idea that the
37
38 Portuguese have a single and exclusive way of connoting the relationships between
39
40 humans and nature, or that the dominant anthropocentric perspective prevails. In general
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42 terms, there was a tendency on the part of the participants to support the new values,
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44 and they were critical of the negative impact of the industrial/capitalist society. This
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46 tendency was more marked among the younger group (between 15 and 29 years of age)
47
48 and in the urban population of the Lisbon area, as well as among those with a higher
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50 degree of education and higher level of environmental culture (determined by a
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52 questionnaire evaluating knowledge on environmental issues). Indeed, the study
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54 participants came out strongly in favour of the following statements which are part of
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3 the aforementioned scale: all species, animal or vegetal, have the same right to exist;
4
5 human intervention in nature frequently has disastrous consequences; humanity is going
6
7 too far in an uncontrolled exploitation of the environment and nature. Of course, these
8
9 results could be deemed incomparable to those from the other previously-mentioned
10
11 studies due to the older age of the participants. However, a study by Littledyke (2004)
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13 with children from the first six years of primary school to elucidate their environmental
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15 concerns, concluded that only the concern related to waste had a greater frequency than
16
17 that related to animals, with the latter taking several forms (exploitation of animals,
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19 animals injured/dying from accidents/pollution, animals dying from loss of habitat,
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21 threatened/endangered species). Thus, new ways of viewing the relationship between
22
23 humans and nature seem to be expanding in modern society, and changes in society may
24
25 radically change the perceptions of people, children naturally included and somewhat
26
27 contradict Kahn's results.

28
29 This discussion is similar to the debate between cognitive and sociocultural perspectives
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31 which have dominated recent theorizing about learning and instruction and how the
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33 concepts change with development and with the complex process of interaction between
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35 individuals in social and cultural activities (Vosniadou, 2007). However, the study of
36
37 cognitive strategies in problem solving, learning and thinking abilities used by children,
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39 together with the influence of the two perspectives mentioned above, are centred on the
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41 children's acquisition of scientific knowledge and changing misconceptions (see
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43 Vosniadou, et al., 2005). Also, their implications have to date been less mobilised in the
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45 construction of human perspectives with a strong ethical influence.

46
47 However, more recent studies revealed that perhaps the incidence of non –
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49 anthropocentric reasoning can, surprisingly, be a function of more simple factors. A
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51 study by Kortenkamp and Moore (2009) specifically revealed the impact of questioning
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3 the kind of answers from the participants, who changed the incidence of their human or
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5 nonhuman-centred reasoning according to the formulation of the questions. Children,
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7 when confronted with situations involving animals where human behaviour was
8
9 considered unfair, considerably increased their biocentric reasoning, even the younger
10
11 children (average age of ten). Also in a more recent study, Severson and Kahn (2010)
12
13 revealed similar results, having found a greater incidence of biocentric thinking than
14
15 that so far presented in developmental literature, in children of the 2nd grade (average =
16
17 7.9 years; range = 7.4 to 8.6) and 5th grade (average = 10.6 years; range = 9.1 to 11.4).
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19 When requested to give their opinion on the behaviour of hypothetical aliens that come
20
21 to earth and commit a series of crimes against the natural inhabitants, including pets,
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23 wild animals, orchards and forests, the majority of the children stated their reasons
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25 using biocentric reasoning. Only those justifications centred on principles of justice
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27 were produced with a greater frequency by the older participants.
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34 35 36 The human contact with nature since the Industrial Revolution

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38 Since the Industrial Revolution the forms of interaction between humans and nature
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40 have also changed, with implications for the perceptions under discussion. Kellert
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42 (1997, 2005) posits that the modern world has followed two trends that complement
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44 each other: on the one hand, day-to-day experience, non-planned, in near natural and
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46 semi-natural places (direct experience) is disappearing due to contemporary
47
48 environmental degradation and increasing urbanization; on the other hand, people are
49
50 increasingly confronted with nature in an unexpected, sporadic and artificial way. This
51
52 situation has led to a kind of knowledge centred on factual aspects learned in places
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54 where nature is managed by humans such as zoos, aquariums and other similar venues
55
56 (indirect experience), and on more spectacular aspects of the different ecosystems,
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3 acquired mainly through the media (symbolic experience). According to Kellert (1997,
4
5 2005) indirect and symbolic experiences of contact with nature are not an alternative to
6
7 direct experience because they are excessively structured. Indirect experience lacks the
8
9 intimacy, challenge, creativity, spontaneity and active participation of direct encounters
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11 with nature.
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15 The impact of all of this on the way in which children value nature is difficult to
16
17 determine because zoos have been abandoning the mere exhibition of animals in small
18
19 barred cages to dedicate themselves instead to breeding programmes, particularly of
20
21 endangered species (Franklin, 2008; Maple, 1995). However, this may help to explain
22
23 the results from a study carried out by Myers et al. (2004) in attempting to understand
24
25 how 171 interviewed children (aged from 4 to 14) envision the needs of animals, after
26
27 visiting the Brookfield Zoo in Illinois. Only 10 explicitly referred to freedom as an
28
29 important need and 16 among the youngest (average age of around 7) even said that
30
31 their captive animal needed a cage, or to remain captive, which seems to indicate that
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33 such places may, in some children produce defective conceptions about the ideal
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35 conditions required for the existence and expansion of various species.
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41 Finally (and what is quite apparent in today's society), it bears acknowledging that the
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43 number of pets has been increasing tremendously, as a sort of compensation for reduced
44
45 opportunities for direct contact with nature. And, as Serpell (1996) claims, "pet owners
46
47 do not value their animals primarily as objects but rather as subjects; as distinctive
48
49 personalities with whom they have affectionate relationships not dissimilar to the kinds
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51 of affectionate relationships they have with close friends and relatives" (p.106). Also,
52
53 despite being the object of the most diverse forms of anthropomorphization (both by
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55 children and adults), they are in fact 'animal ambassadors', mediators establishing a
56
57 kind of moral link with other types of animals and even nature (Serpell, 2005).
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3 Therefore, as Melson (2001) states, there is a real possibility that those who care for
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Therefore, as Melson (2001) states, there is a real possibility that those who care for
pets during their childhood may be more sensitive to animal welfare in general and have
more ecological concerns, as was revealed in a study with British university students.

The present study

The purpose of this study was to verify the incidence of anthropocentric, biocentric and
ecocentric reasoning in children attending the two final years of the 1st cycle Primary
School (ages 8 to 10). This was implemented due to a certain degree of dissatisfaction
with the results obtained by Kahn (1999, 2002) in his studies, which revealed an
extremely low frequency of biocentric reasoning in children of similar ages and even in
older groups when questioned about the seriousness of different environmental
problems (although this frequency tends to increase with age). However, the question
arose as to how adults would respond for instance, when asked why it is negative to
pollute a river. Wouldn't the majority give reasons centred on the human being?
Doesn't the form in which one sets the question condition the frequency of occurrence
of the two main types of reasoning under discussion here?

So, we hypothesed, based on other studies already mentioned, that children can generate
a much higher incidence of, at least, biocentric reasoning, depending on the questions
posed considering the two following principles: (1) when questions don't appeal
directly to an anthropocentric reasoning, because a human threat is evident; (2) when
the dilemmas proposed involved animals, and human attitude is considered too
egotistical. We also hypothesed that several independent variables such as school year
(related to age), gender (in this case, girls) and contact with more biologically complex
pets can interfere positively in the incidence of non-anthropocentric reasoning (see
statistical data treatment for further details).

Participants

This study involved a sample of 123 white Portuguese children (61 boys and 62 girls), aged between 8 and 10 (average 8.52 and $\sigma = 0.548$), attending the 3rd (67 – 54.4%) and 4th (56 – 45.5%) years in 3 primary schools from the Lisbon area. These schools are attended by middle- and upper middle-class children and 69 (56%) of them said they had pets at home: 47 owned at least one mammal (greater numbers of dogs and cats than hamsters and rabbits). Other students also referred to non-mammals (birds, tortoises and fish).

These children were chosen because they were pupils of teachers who are usually involved in initial training courses for new primary teachers and were recommended by the coordinator of one of these courses as being particularly receptive to educational research. All teachers had followed their pupils since the first school year and were not involved in projects related to animal welfare or animal rights. In addition, they had never explored the didactic or relational potentialities of including animals in their classrooms.

Procedure

The children were interviewed about a few ecological dilemmas and questions centred on animals, following written consent from all respective parents in a document where the research study was explained along general lines. The objectives of the interview were also explained to children in class. It was made clear that there would be no right answers but that it would be important to hear their opinions about certain nature subjects. The importance of recording the interviews to help remember what they had said was also explained.

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3 All interviews took place in the first ten days of October 2009 in a quiet room as near to
4 each classroom as possible. Each child was interviewed alone and would then return to
5
6 each classroom as possible. Each child was interviewed alone and would then return to
7
8 class and call the next. Teachers were asked to discourage conversation in class between
9
10 already interviewed children and those still waiting. The interviews were conducted in
11
12 Portuguese and lasted for 15 minutes, which was considered an appropriate length for
13
14 attention and involvement in children of these ages. To guarantee consistency across all
15
16 interviews and increase the validity of the data, all respective interviews were conducted
17
18 by the same interviewer, following the same interview schedule and keeping the same
19
20 emphasis on the formulation of questions and acceptance of answers.
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24 An interviewing style based on a friendly manner created a relaxed atmosphere and the
25
26 use of appropriate language matched to the age and ability of primary students was
27
28 considered to both ensure good communication and encourage the children to express
29
30 their own views. With a view to obtaining a better understanding of children's ideas,
31
32 clarification or elaboration was sometimes requested. To assess the convictions of the
33
34 children about a certain problem or dilemma, a counterargument would be posed. The
35
36 interviews were audio taped for a better transcription of children's ideas.
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43 Interview questions

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45 We applied a structured interview with open questions since we thought this would be
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47 the best way to obtain a spontaneous ethical reasoning. The questions used and their
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49 nature are shown in the following table.
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55 **Table 1 – Interview questions and their nature**

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57 (insert table 1)
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3 The questions chosen served to: (1) verify the incidence of non-anthropocentric
4 reasoning in children using one ecological dilemma to relate to a real scenario and two
5 ecological dilemmas in relation to a hypothetical scenario, and; (2) establish those
6 places they visited which permitted contact with animals and whether they have pets,
7 using direct questions to know experiential aspects of the children's life. All questions
8 were written by the research team and selected from a list formulated in a group creative
9 process. The ecological dilemmas in particular were chosen for the following reasons:
10 the principal reason was based in factual information in Kurlansky's (1999) book *A*
11 *Biography of the Fish that Changed the World* and was considered a very conflicting
12 situation due the weight of codfish in the Portuguese diet. The other two dilemmas,
13 which were very similar, served to test hypothetical differences in children's answers,
14 considering two mammals of different size and characteristics.

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Having constructed the interview, it was then essential to pilot it. Six children of similar age were asked to answer the questions to detect any language limitations or other unforeseen difficulties. The above-mentioned teachers were also asked to read the questions so that they could verify the appropriacy of language to their pupils. During the pilot session no problems were found. However, some of the sample children could not remember any places with animals they had visited or, if so, the names of those places. Consequently, some information was lost here.

The involvement of children in the interview was very good: all were interested in answering and were uninhibited. Kahn (1999) considers that such aspects increase confidence in the data gained and contribute to the validity of the answers.

Scoring

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3 Answers were coded in a similar way to the studies by Kahn (1999) but with some
4
5 modifications. If the answer was centred on any kind of benefit for the human being in
6
7 general or for the child in particular, it would be classified as anthropocentric. This can
8
9 be done by appealing to an economic value of nature but also to a physical,
10
11 psychological, educational or aesthetic value, in contributing to personal or societal
12
13 welfare. If the reasoning was centred on the interests and needs of other living beings,
14
15 independently of human interests, it would be classified as biocentric. This can be done
16
17 by appealing to rights and respect to animals, using a kind of isomorphic thought
18
19 between determining what is right for humans should also be right for other biological
20
21 entities or criticizing human behaviour as selfish and even suggesting a change in
22
23 human behaviour.
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29 In cases where answers appealed for holistic relationships between different natural
30
31 entities, appealing to a system of interconnectedness, dependencies and harmony and
32
33 revealing nature working as a whole (compositional thought), it would be classified as
34
35 ecocentric. If more than one type of reasoning was present (for statistical treatment
36
37 only), we considered that which revealed a less human-centred perspective of nature,
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39 thereby assuming a hierarchy between these three different types of reasoning (from
40
41 anthropocentric to ecocentric reasoning).
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48 Validity and Reliability

49
50 The content validity of the interview was guaranteed in order to subsequently permit
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52 appropriate interpretation of scores. In this study, the team choose a content validity
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54 determined by the judgment of three experts. The experts carefully reviewed process
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56 used to the interview questions and made judgment about how well the questions
57
58 represented the intended content area.
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3 To guarantee internal consistency of the codification process, the different answers were
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5 independently analysed by each team member. The answers which were codified
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7 differently were submitted for team discussion so that a final consensus could be
8
9 reached.
10

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12 In the process of data analysis, relative frequencies of the different types of answers
13
14 were obtained. Some examples of the answers provided by the children are also
15
16 included for a better understanding of their codification. Some of these transcriptions
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18 were subject to a degree of linguistic correction. Seidman's (1998) recommendation was
19
20 thus followed as he considers that some corrections are justified in order to preserve the
21
22 dignity of the participant in the written presentation of their oral discourse.
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25
26 A researcher outside the research team scored the same data, after reading some
27
28 introductory ideas about anthropocentric, biocentric and ecocentric perspectives.
29
30 Agreement with the scoring from the research team was total with the exception of one
31
32 of the reasons given by children for preferring, liking or disliking the places where they
33
34 met animals. The reason "because it is possible to watch aspects of their behaviour" was
35
36 considered anthropocentric by revealing a scientific interest about the animals (see
37
38 discussion section).
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43 44 45 Statistical data treatment

46
47 For data analysis, descriptive statistics were used to treat data for scoring the
48
49 frequencies of children's answers after codification. Inferential statistics, namely the
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51 SPSS (Statistical Package for Social Sciences) was also used to attempt to establish the
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53 influence of a number of independent variables on the incidence of the different types of
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55 reasoning under discussion. These variables, as well as the justification for their choice,
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57 were as follows:
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3 -School year of the children – many teachers (based on their experience) believe that
4 pupils make significant cognitive progress between the 3rd and 4th years by becoming
5 more efficient in the use of certain competences. As the children interviewed belonged
6 to the above-mentioned two school years, some differences might have occurred in the
7 two groups.
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15 -Gender – several studies have shown that females are more concerned with issues
16 related to animal welfare and rights, and become more involved in pressure groups
17 fighting for these same causes (Paul, 2005). Although all participants were children, this
18 study attempted to differentiate answers by gender.
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24
25 -Contact of the children with pets – considering the aforementioned research studies
26 which claim that there is a positive effect of owning pets on the recognition of animal
27 welfare and even on the interest of nature preservation, an attempt was also made to
28 identify possible differences in children's thoughts caused by this variable. Two further
29 groups were created with (1) children who had mammal pets and (2) those who did not.
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The greater complexity of these animals permitted richer and more diverse kinds of interactions with humans and might reinforce the above-mentioned positive effect.

-School of origin – the children attended three different schools. Although none of the teachers were involved in projects related to animal welfare and no specific activities were conducted in the three schools around this topic, learning contexts remain diverse. An attempt was made to try to identify alterations in the type of reasoning caused by this variable.

Results Analysis

The results obtained from the interview questions are shown as follows, except for the question on pets, which served as an element for sample characterization. As far as the

1
2
3 places where children said they had seen animals, and their preferences for certain
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5 places, the respective results are systematized in Table 2.
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10 **Table 2 – Places where children said they had seen animals and their preferences**

11 (insert table 2)
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15 It is important to note that several children mentioned multiple places where they had
16
17 seen animals, which explains why the sum of the frequencies for each place is higher
18
19 than the number of children interviewed. Some children would also provide a non-
20
21 coded answer due to its vagueness (for instance, in Spain) or to absurdity (for example,
22
23 in a submarine). Thematic animal parks are prominent in the list (mentioned by 75
24
25 children) as is the case of zoos, other parks housing animals with some species in a
26
27 semi-captivity situation, as in Badoka Park (an open park near Lisbon with savannah
28
29 animals) as well as oceanariums of the kind. Urban spaces (referred to by 49 children)
30
31 and rural spaces (25 children) come next in the rank. These three kinds of spaces
32
33 represent 70% of those mentioned and refer to places where animals are held in
34
35 captivity or semi-captivity. On the contrary, seeing animals in natural spaces was
36
37 mentioned only by 37 children (30%).
38
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43 As for the preference of those interviewed for each of these places, 56 children
44
45 mentioned only one place, which made a choice impossible, or did not show any clear
46
47 preference. Of the others (63), the majority preferred places where animals were in
48
49 captivity or semi-captivity which reflects the incidence given to the previous answer. In
50
51 such places, 31 children chose thematic places with animals, with zoos being their
52
53 favourite. Also according to the relative frequencies obtained for the previous question,
54
55 only 15 children preferred to natural spaces.
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3 The reasons for preference are systematized in Table 3. Data include the answers given
4 by children who mentioned only one place or more than one without expressing their
5 preference. In this case, the question was reformulated to establish whether they had
6 appreciated seeing the animals in the place or places referred to. Among them, 79 (64%)
7 said they liked to see them where they were, 27 (22%) did not like it and 17 (14%) did
8 not know. Their reasons (positive or negative) were classified as anthropocentric or
9 biocentric, according to the above-mentioned criteria. It is important to bear in mind
10 that several children gave more than one reason but only three presented reasons of both
11 environmentalist perspectives simultaneously.
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27 **Table 3. Reasons given by children for preferring, liking or disliking the places**
28 **they mentioned**

29 (insert table 3)

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33 Anthropocentric reasons are represented to a greater extent, with numerous references to
34 the fact that the animals were attractive for different reasons (32), the number of
35 animals that can be observed and/or that are unfamiliar (24) and the possibility of
36 contact and interaction (15). Other reasons (though to a smaller extent), were interesting
37 because of the ideas they express and for the formulation of the answers. This group
38 contains the answers given by two children on how much fun they had with establishing
39 animal contact. One child replied: 'I enjoyed watching the dolphins jump. I like to
40 watch the animals because they amuse children'. Some answers provided more than one
41 anthropocentric reason simultaneously. 'I enjoyed seeing them most in the zoo because
42 there I can find animals I like and there are animal shows'.
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57 Despite their low frequency, biocentric reasons had some weight, emphasising the fact
58 that the animals were free and/or in their habitat. For example: 'I preferred to see them
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3 in the forest because they are in the open air and immersed in nature and that's the place
4
5 where they should be'.
6

7
8 The last biocentric reason, 'because it is possible to watch aspects of their behaviour',
9
10 was classified in this category with certain reservations, also considering the opinion of
11
12 the researcher outside the research team. In fact, the observation of behavioural aspects
13
14 may show a scientific interest in relation to animals but it may also be of interest in the
15
16 characteristics of other beings, a recognition of their specificities. In any case, if this
17
18 sort of answer is not considered as biocentric, the total number in this category will
19
20 decrease further, emphasising its low frequency.
21
22

23
24 The answers to the question 'Do you think they liked to be where they were?' covered a
25
26 broader span of situations: 67 children said 'Yes' (54.5%); 24 said 'No' (19.5%); 13
27
28 said 'More or less' (10.6%); 13 said 'Yes and No' (10.6%); 'Yes and More or less', 1
29
30 (0.8%); 'No and More or less', 1 (0.8%). The last three types of answer responses show
31
32 that some children mentioned more than one place, having evaluated them differently
33
34 and mentioned more than a single reason. Only four children failed to answer this
35
36 question.
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40 As for the reasons presented, their nature shows an almost total inversion of the type of
41
42 answer given to the previous question, now clearly non-centred on the human being, as
43
44 can be seen in Table 4.
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51 **Table 4 –Reasons given by children when evaluating if animals liked or did not like**
52
53 **to be where they saw them**

54
55 (insert table 4)
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3 The biocentric reasons were primarily of two types: references to favourable conditions
4 for development of the animals and to manifestations of welfare. Both types of
5 references are even made to places where animals are held in captivity and correspond
6 to a very dissimilar evaluation of those places. Some answers given about zoos are a
7 clear example of this. For one child, “animals enjoy being in the zoo because they are
8 well fed and have large open spaces”. Another one says, “I think they like it. It’s their
9 home”. On the contrary, another child answered, “No, because the zoo is a place with
10 small spaces and the keepers who work there don’t feed the animals with food they like.
11 They always give them the same thing to eat”. On the subject of zoos, yet another child
12 says, “In the zoo some animals are sad because they were caught only to be on show,
13 and get scared seeing many people around them”. Regarding zoos, some examples of
14 anthropocentric reasoning were also produced. A child confirming anthropomorphism
15 processes stated, “Yes, because they are being watched and also because some people
16 feed them”.

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These anthropomorphism processes are also revealed when a child says, “I think some
animals like it because they are on the verge of extinction and they know that they are
protected there”, assuming that animals possess a perception of the predicament in
which their species finds itself.

Though they appear with low frequency, the answers that show some doubts about the
fact that animals can feel secure in a natural environment are equally interesting.
“Animals feel well in the sea, except for fish, which are afraid of being caught by
fisherman”; or “In the forests it is complicated. Hunters go there and then kill them. But
in the zoo, lots of people visit them and they like it and feel happy”.

The results of the analysis of the responses to the first ecological dilemma, dealing with
a real scenario, will now be considered. The great majority of children, 102 (83%),

1
2
3 considered that the action was negative, 9 (7%) considered it positive, 10 (8%)
4
5 evaluated it both as negative and positive and 2 (2%) did not answer. Reasons given are
6
7 shown in Table 5, grouped according to the discussed perspectives (anthropocentrism,
8
9 biocentrism and ecocentrism). Some children justify their answer with more than one
10
11 reason from the same perspective, while others use reasons from different perspectives.
12
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16
17 **Table 5 – Reasons for agreeing or disagreeing with the slaughter of seals, as**
18 **described in the real dilemma presented**
19

20 (insert table 5)
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24 Biocentric reasons were clearly in the majority, and among these is the idea that seals
25
26 are living creatures and deserve to live (65 answers). A good example of this is
27
28 expressed in the following: “They did wrong because they shouldn’t kill. They were bad
29
30 to the seals. It would be the same if they had killed us”. Also, a large number answered
31
32 that seals have the right to eat and that we should not only think about ourselves. “They
33
34 did wrong. Maybe seals don’t like other kinds of food, or can’t find another one they
35
36 like as much, but we have different kinds of food: cereals, meat and all those things”.

37
38
39 Only six children revealed anthropocentric reasoning and three emphasized the idea that
40
41 seals are good and friendly and produce public displays. It is important to note that ten
42
43 children produced ecocentric reasoning and five argued that seals are part of nature,
44
45 which projects an idea of nature being a complex network of relationships which
46
47 depends on the presence of all elements to work well. And, as one child states, “Nature
48
49 is exactly like that. Animals eat each other to survive”.

50
51
52 Concerning the solutions suggested to solve this dilemma (see Table 6), it should be
53
54 noted that they were only asked of those children who had somehow disagreed with the
55
56 original solution provided. Among those who disagreed, 48 did not come up with any
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3 alternative solutions. The others proposed anthropocentric and biocentric reasons at an
4 almost identical frequency (39 and 33, respectively). Two children suggested two
5 biocentric solutions each and another two suggested a solution of each type.
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12 **Table 6 – Alternative solutions to the slaughtering of seals suggested by children**

13 (insert table 6)

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16 One should note here that anthropocentric solutions aim in different ways to transform
17 the nature of seals, highlighting once again anthropomorphic thinking. Note for
18 instance, how five children considered it possible to change the diet of seals in the same
19 way as it is possible to do so with humans. “We could start feeding them with other
20 kinds of fish. Fish they could eat and we wouldn’t”. Or, “I would feed them with
21 sardines. They would get used to it. That’s how they feed them in the zoo and we would
22 keep cod for us”. Of the same type were the unrealistic solutions that follow, though the
23 child that produced the third statement is perfectly aware of its impossibility. “I would
24 build a huge swimming-pool where I would put all the seals and then would fish the
25 cod”; “One could put the seals into oceanariums and fish the cod”; “It is complicated.
26 Only if we could build a wall in the sea and put the seals on one side, but that’s
27 impossible”.

28
29
30 Biocentric solutions call for the need to change human behaviour. Some examples
31 include: ‘We could fish less cod and eat less too. And we could eat other kinds of fish’.
32 Or, in a more radical way: ‘Everybody could become vegetarians’. Some conciliating
33 solutions were also suggested: to share cod with the seals (10) and to increase the
34 reproduction of cod (2).

35
36
37 Concerning the hypothetical dilemmas, data will be analysed simultaneously as far as
38 possible, with the aim to verify possible differences occurring in the treatment of similar
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3 situations with different animals. Children's appreciation of both dilemmas was similar
4
5 and only three children failed to comment on the dilemma about the hedgehog.
6
7 Concerning this problem, 98 (80%) children considered it a bad decision, and this
8
9 number rose to 105 (85%) with the fox dilemma. Only 17 (14%) children considered it
10
11 to be a good decision in the first dilemma and 14 (11%) in the second. Two children
12
13 said it had been a good and bad decision at the same time in the first dilemma, and three
14
15 in the second. Finally, three revealed some indecision in the first dilemma and only one
16
17 in the second. The justifications found for their agreement or disagreement are
18
19 presented in Table 7 and have been coded according to the perspectives under analysis.
20
21 Some children also gave more than one reason.
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29 **Table 7 – Reasons for agreeing or disagreeing with the action of capturing a**
30 **hedgehog and a young fox and putting them in a backyard in an urban**
31 **environment**
32
33

34 (insert table 7)
35
36
37

38 It is interesting to note that the majority of reasons were of a biocentric type and most
39
40 were linked to disagreement with the action of capturing the animals. Nevertheless, the
41
42 fact that the dilemmas dealt with animals of different size and characteristics and that in
43
44 the case of the fox a young animal was involved, led to a dissimilar frequency when
45
46 compared to the reasons given. Therefore, from all the reasons presented in Table 7 the
47
48 following should be given precedence. Being separated from the mother/family was
49
50 mentioned by 50 children as a reason to disagree with the action of capturing the young
51
52 fox and only by 12 in the case of the hedgehog. Similar reasons led the children to agree
53
54 with the action, believing in this case that the young animal had been abandoned. 'They
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3 did the right thing to take it because the young animal was alone. They could look after
4
5 it and then release it. Unless the animal would like to stay’.

7
8 The idea that both are wild animals living in the woods and therefore should not be
9
10 taken to a backyard appears with a high frequency (60 and 29 answers, respectively).

11
12 However, the smaller size of the hedgehog led six children to agree with the stated
13
14 action, on the assumption that the backyard would certainly satisfy their needs for space
15
16 and food. One child expressed her understanding of the different needs of the two
17
18 animals very well: ‘They did wrong because foxes need to hunt and to learn on their
19
20 own. They run a lot and need the woods. The hedgehog is different because it is small’.

21
22 Anthropocentric reasons generated the most curious answers because of the ideas they
23
24 express. An example of this is the fact that 25 children were apprehensive of the
25
26 possibility of the fox attacking people or wrecking things. ‘They did wrong because it
27
28 will grow up and could then kill people. Foxes are carnivorous’; ‘The fox would kill
29
30 them when it became an adult animal. Foxes are dangerous and cunning’; ‘Everybody
31
32 knows that foxes are naughty: they can go into the house, ruin things and eat all the
33
34 food’.

35
36 In the case of the hedgehog, its prickly aspect impressed six children. Two examples
37
38 here are relevant: ‘They did wrong because they could prick themselves. If they had a
39
40 baby, the baby could touch it and get pricked’; ‘If someone appeared, they could get
41
42 pricked with its spines’.

43
44 It is also important to emphasize that for some children, agreeing with the actions
45
46 presented in both dilemmas is induced by the belief that the backyard is safer than the
47
48 woods for both animals. In the case of the hedgehog: ‘They did well, because other
49
50 animals could attack it. It is more protected in the backyard, if they haven’t got a dog’.

1
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3 In the case of the fox: 'Cheetahs, for example, chase their prey in Africa. Some animals
4 chase foxes too, so there they are protected'.
5
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7
8 Finally, we wanted to verify if the incidence of anthropocentric, biocentric and
9
10 ecocentric thinking (the latter inexistent in the majority of answers) varied according to
11
12 gender, contact with complex animals (mammals), school origin of the children and
13
14 school year (aspect related to their age). Results obtained with the questions capable of
15
16 generating the different types of thinking were analysed according to the different
17
18 variables. We used the chi-squared test (χ^2 - non-parametric statistics) to test the
19
20 homogeneity between groups with regard to the incidence of the discussed perspectives,
21
22 while the level of significance used for the tests was always for values of $p < 0.05$ (Table
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**Table 8 - Level of significance obtained after application of the chi-squared test
(χ^2) to each of the questions capable of generating anthropocentric and non-
anthropocentric thinking according to the independent variables gender, school
year of the children, contact with animals and school origin**

(insert table 8)

We followed the recommendation of Conover (1999) who considers that this test remains valid even for very low rates of expected frequency, provided they do not fall below 1 - even if in some cases, the applicability of the test was verified and in those cases, only a discussion of frequencies was possible. We did not **found** any differences concerning gender, direct contact with mammals and school origin. In the last case, this confirmation was considered important because it supports a certain degree of sample homogeneity. Considering the school year of the children, the results proved interesting for a couple of reasons. In those questions in which the generation of biocentric thinking

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3 is supposedly easier (as it is the case with that asking the children to evaluate the living
4 conditions of the animals in those places where they saw them and with the two
5 hypothetical dilemmas involving the hedgehog and the fox), no significant differences
6 were found between the two groups (3rd and 4th school years respectively). For those
7 questions in which the generation of biocentric reasoning is supposedly more difficult
8 (as is the case of that directly appealing to the self and asking for an alternative solution
9 for the real codfish dilemma) the older children attending the 4th year, revealed a greater
10 incidence of this type of reasoning. This fact seems to support the previously referred
11 view held by 1st cycle teachers on the presence of a greater development of children in
12 this school year, thereby confirming the possibility of a higher incidence of biocentric
13 thinking evolving with maturity.
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32 **Conclusions**

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34 The findings from this study confirm the hypothesis that young children can generate a
35 much higher biocentric reasoning than that shown in the main studies by Kahn (1999,
36 2002), as previously mentioned. Our findings also confirm that school year (related to
37 age and cognitive development) can interfere positively in the incidence of a non-
38 anthropocentric reasoning but not gender and contact with more biologically complex
39 pets. These findings support more recent aforementioned research to the effect that the
40 incidence of biocentric reasoning could depend on the way situations were posed for
41 children. Therefore, the results may be interpreted as occurring for two reasons: on the
42 one hand, the focus of the questions seems to condition this incidence strongly. We can
43 see how the majority of the children interviewed (having indicated places where they
44 had observed animals) responded in an anthropocentric manner when expressing their
45 preference for those places, but in an almost exclusively biocentric manner when they
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3 evaluated the same places from the perspective of animal welfare. On the other hand,
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5 when confronted with hypothetical or real dilemmas involving unpleasant situations for
6
7 the animals, in which human action is considered unfair or egotistical, the majority of
8
9 their answers were equally biocentric. A clear example of this is the codfish dilemma,
10
11 portraying a merciless kind of human action, motivated by commercial reasons.
12
13 However, the prevailing contact of children with spaces where nature is managed by
14
15 man, to the detriment of natural spaces, does not seem to decrease the frequency of
16
17 biocentric reasoning although some younger children believe that these places are the
18
19 natural habitat of certain animals. This could be interpreted as a potential source of
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21 concern, and the importance of earlier contact of children with natural places, to
22
23 augment a better understanding of the needs of other living beings.
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29
30 Despite the higher frequency of biocentric reasoning, it is important to mention two
31
32 situations in which a lower frequency was obtained. The first concerns the alternative
33
34 solutions given by the children to the slaughtering of seals as a potential solution to the
35
36 codfish problem. Here, the number of anthropocentric solutions was slightly higher than
37
38 that of biocentric solutions, which implies a certain degree of agreement with the
39
40 described human action, the continuity of cod fishing, if done less intensively. For more
41
42 than half the children who presented an alternative solution, a lower impact would
43
44 imply uncovering strategies to separate seals from codfish or changing their diet and not
45
46 finding solutions aimed at changing human behaviour. This result might imply that,
47
48 with the concrete need to act to solve certain problems, the operationalization of
49
50 biocentric reasoning could lose some ground. Still, since statistically significant
51
52 differences were found between the 3rd and 4th year children for this dilemma, we can
53
54 assume that in conceptually more demanding questions and the incidence of biocentric
55
56 reasoning will partially depend on a greater cognitive maturity.
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3 The second situation (though less significant in numerical terms) relates to the fact that
4 almost one sixth (1/6) of the children in the sample disagreed with moving the young
5 fox to a backyard because of the danger this animal would represent to humans when it
6 became an adult.
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12 The reference to the danger of foxes to humans is certainly disproportionate and may
13 have been caused by the influence of stories and myths created about a number of
14 animals, often determining their preservation negatively. However, this seems to
15 indicate that the frequency of biocentric thinking in children can be influenced by the
16 type of animals present in certain problematic situations (dilemmas). The evaluation of
17 their danger (real or hypothetical) for humans seems to lead to a decrease in this kind of
18 thinking and other factors such as empathy, experience and scientific knowledge are
19 also expected to influence a higher frequency.
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31 Mechanisms of hierarchizing the species are thus generated which do not always follow
32 plausible criteria. This result is unsurprising if we consider certain movements
33 occurring in society. As Miller (1998) claims, “animal rights advocates have not
34 mounted major campaigns to protect individual bats, spiders, sharks or snakes from
35 being killed, nor have they taken a strong stand that doing so is wrong” (p. 750).
36 However, the issue is not simply confined to a hierarchy based on animal complexity, as
37 was made clear in the results of this study, in which the most complex deserve greater
38 moral consideration. As Neversand Gebhard (1997) verified, children older than ten
39 would not hesitate to subordinate their interests to those of an animal, particularly if it
40 was a pet. But, the same would not happen if the interests of a domestic pig were at
41 stake. And, as Melson (2001) states, cultural images transmitted about animals are
42 deeply contradictory: to fish and hunt are prized, familiar practices, but to attack
43 wandering cats is considered barbarian; thousands of animals die in slaughter houses
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3 but the slaughtering should not be appreciated or the suffering prolonged; some species
4 are served as food in certain places and venerated in others.
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8 This study raises the issue of what the incidence of biocentric thinking would be if, in
9
10 the case of the codfish dilemma, seals were replaced by another animal capable of
11
12 generating less empathy in children, like, for instance, sharks? And if in the
13
14 hypothetical dilemma, we instead used a more dangerous animal such as a wolf, for
15
16 example?
17
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19
20 It is important to bear in mind that the answers given by the children revealed
21
22 anthropomorphic thinking in several situations by conferring supposedly human
23
24 capacities on non-human animals. Serpell (1996) claims that the tendency to
25
26 anthropomorphize animals does not necessarily lead to consideration of their interests.
27
28 For instance, some predators can be judged as dangerous or brutal solely on the basis of
29
30 their natural characteristics. Nevertheless, the processes of anthropomorphization also
31
32 favour processes of identification with other animals. As Myers et al. (2003) says, these
33
34 processes should be envisaged as seeds of mature forms of valuing other animals,
35
36 species and systems and not as ways that detract from ecological understanding.
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40 Consequently, the findings from this study may be important for parents and
41
42 particularly primary schools in selecting broader types of places where it is possible for
43
44 students to observe animals in their free time or as part of their outdoor activities.
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48 The results from the present study could be of great relevance both for parents and
49
50 particularly, 1st cycle teachers. The potential for child contact with a wider number of
51
52 places where they can interact with animals can unquestionably perform an important
53
54 role in the development of a more effective understanding of the needs of other living
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56 creatures and the factors that contribute more to their well being. This form of contact
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58 maybe can help to reduce some of the forms of anthropomorphic thinking so commonly
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3 seen in children. Therefore the importance of the children's contact with different
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5 places, from controlled environments depending ongoing human management to those
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7 of a less human intervention nature in the incidence of non-anthropocentric reasoning
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9 should be studied.
10
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12 From an educational point of view, the capacity of children to think in a non-
13
14 anthropocentric way can be fostered through the selection of issues and activities that
15
16 also lead to the perception of the conditions that favour the welfare of other living
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18 creatures and to a progressive perception of the multiple biotic and abiotic interactions
19
20 occurring in nature. It can allow a better exploration of controversial issues in the
21
22 curriculum, some of them linked to science education, like the use of animals in
23
24 circuses, the use of animals in science, the introduction of living beings into
25
26 ecosystems, the trade in exotic animals, the cultural performances involving animals or
27
28 simple hunting. Of course, the choice of the issues can never lose sight of the subject
29
30 suitability, nor the adoption of approaches geared to the age of the pupils taken not in a
31
32 deterministic way but as a factor which, linked to psychological development, can affect
33
34 the comprehension of certain arguments. Moreover when some children think in a non-
35
36 anthropocentric way, the issues debates can expose other children to arguments that
37
38 they never considered before.
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45 To conclude, it should be said that there is nothing intrinsically wrong with
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47 anthropocentric reasoning, since it is used by children and adults in many situations.
48
49 However, it is difficult to disagree with Rolston III (1994) when he states, "An
50
51 admirable trait in persons is their capacity to appreciate things outside themselves,
52
53 things that have no economic, medical or industrial uses, perhaps even no ordinary
54
55 recreational, aesthetic or scientific value" (p.163). This is why non-human centred
56
57 reasoning is so important.
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4

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6 Forest University, School of Medicine of Wiston-Salem, North Carolina, United States.
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For Peer Review Only

Table 1. Interview questions and their nature

Number	Question	Nature of the question
1	Can you tell me some places where you have met animals? Where did you like to see them most? Why? Do you think they were pleased in the places where you saw them?	Question about experiential aspects of the child Question about child's beliefs
2	Do you have pets?	Question about experiential aspects of the child
3	Do you know a fish called codfish? Do you know that this fish is decreasing in the oceans because its fishing is increasing? Well, some scientists discovered that seals also eat codfish. So, in Canada, the authorities decided to kill a lot of seals to prevent the continuous decreasing of this fish. Do you think this was a right or a wrong decision? Why was it a right decision? If this was not a right decision, what other measure would you take?	Ecological dilemma in relation to a real scenario
4	A family went for a walk in a forest and found a hedgehog. One of the members caught it and brought it to their backyard. Do you think this was a right or a wrong decision? Why?.	Ecological dilemma in relation to a hypothetical scenario
5	A family went for a walk in a forest and found a young fox. One of the members caught it and brought it to their backyard. Do you think this was a right or a wrong decision? Why?.	Ecological dilemma in relation to a hypothetical scenario

Table 2. Places where children said they had seen animals and their preferences.

	Places where you have seen animals	Where did you like to see them most?
Urban spaces	49	7
Urban and suburban green spaces	38	7
Homes	14	-
Shops	1	-
Kennels	1	-
Rural spaces	25	10
Farms	25	10
Thematic places with animals	75	31
Zoos	71	25
Badoka Park and the kind	12	3
Oceanariums, aquariums and fluviariums	11	3
Natural spaces	37	15
Woods, forests, fields	29	13
Beaches, sea coast	5	-
Natural parks/ reference to such	5	2
Non-codifiable answers	21	60
Unsure answers/ vague places	15	4
Absurd answers/does not know/does not answer	6	56

Table 3. Reasons given by children for preferring, liking or disliking the places they mentioned.

Anthropocentric reasons	90
Because there were many animals / many unfamiliar animals (or the opposite)	24
Because the animals were cute/ beautiful/ playful /sweet/ friendly	32
Because I had direct contact with the animals or interacted with them (or the opposite)	15
Because I saw my favourite animal there	12
Because it was a new place for me	2
Because I had more fun and there were animal shows	2
Because I learned things about the animals	3
Biocentric reasons	27
Because they are free and/or in their habitat (or the opposite)	18
Because they are well looked after	1
Because it is possible to watch aspects of their behaviour	8
Doesn't know	17

Table 4. Reasons given by children when evaluating if animals liked or not to be where they saw them.

Reasons for liking		Reasons for disliking or liking more or less	
Anthropocentric reasons	4	Anthropocentric reasons	-
-They like to show off to humans	4		
Biocentric reasons	84	Biocentric reasons	52
Favourable conditions for their development		Unfavourable conditions for their development	
-They had space/ food/ were well looked after	42	-They had little space/ no food/ were abandoned	7
-They were in their habitat	9	-They had unfavourable abiotic conditions	1
-They like to be free	8	-They were imprisoned/ should be free	41
Manifestations of welfare		Manifestations of lack of welfare	
-They were having a good time	24	-They are scared by people	1
-They were protected against extinction	1	-Hunters/Fishermen kill them	2
Doesn't know/ doesn't answer			4

Table 5. Reasons for agreeing or disagreeing with the slaughter of seals, as described in the real dilemma presented.

Agreement with the action		Disagreement with action	
Anthropocentric reasons	20	Anthropocentric reasons	6
So that cod does not disappear or decrease in numbers and we can eat it	19	Seals are good and friendly and make shows	3
Only if they do not kill too many (moderate anthropocentrism)	1	There are no seals for children to watch or for zoos	2
		Because I like seals	1
Biocentric reasons	2	Biocentric reasons	101
To protect codfish and prevent extinction	2	Seals need to eat/ have the right to eat/ we shouldn't think only about ourselves	22
		Seals are living animals and also deserve to live/ animals shouldn't be killed	65
		Seals are/ will be on the verge of extinction	14
		Ecocentric reasons	10
		Seals should live in peace and harmony	2
		Seals are an element from nature	5
		Seals are essential to the sea	2
		Nature works like that	1

Table 6. Alternative solutions to the slaughtering of seals suggested by children.

Anthropocentric solutions	39
To separate seals from fish/ put them in a different place	33
To make them familiar with fish	5
To fish the cod before the seals do it	1
Biocentric solutions	33
We should eat other kinds of fish	10
To fish less/ to eat less	11
To fish where there are no seals	2
To share with seals (conciliating)	10
To increase codfish reproduction (conciliating)	2
Doesn't know/ never thought about it	48

Table 7. Reasons for agreeing or disagreeing with the action of capturing a hedgehog and a young fox and putting them in a backyard in an urban environment.

Agreement with the action	hedgehog	young fox	Disagreement with the Action	hedgehog	young fox
Anthropocentric reasons	-	-	Anthropocentric reasons	13	25
			It can prick people	11	
			It can transmit diseases and cause allergies	2	
			It can attack people and ruin things	-	25
Biocentric reasons	17	15	Biocentric reasons	101	98
The backyard offers conditions (space and food) for looking after the animal properly	6		The animal wants to be free	20	9
To take care of the animal	2	8	Those are wild animals that live in the woods	60	29
Difficulty of adaptation to the woods of a young animal	1		It is kept apart from its family/ it should stay with its mother	12	50
The backyard is safer than the woods/ protection from predators	5	5	The backyard is not suitable	2	4
The animal would like it	2	1	They don't know what they eat / how to feed them	5	5
One should ask the animal	1	1	They could hurt it	1	
			They wouldn't be able to look after it when on holiday	1	
Impossible to codify					
It would look nice in the backyard	1				
It eats animals on the verge of extinction		1			

Table 8. Level of significance obtained after the application of the chi-squared test (χ^2) to each of the questions able to generate anthropocentric and non-anthropocentric thinking according to the independent variables gender, school year of the children, contact with animals and school origin. (ns –not significant)

Questions Variables	Where did you like to see them most? Why?	Do you think they were pleased in the places where you saw them? Why?	The codfish real dilemma	Alternative solution to the real codfish dilemma	The hedgehog hypothetical dilemma	The young fox hypothetical dilemma
School year of the children	p = 0.041*	ns	p = 0.275	p = 0.043*	ns	p = 0.827
Gender	p = 0.101	ns	p = 0.473	p = 0.962	ns	p = 0.134
Contact with mammals	p = 0.559	p = 0.215	ns	p = 0.460	ns	p = 0.252
School of origin	p = 0.273	ns	ns	-	ns	p = 0.962
p < 0.05* (level of significance)						