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**Abstract.** *This research focused on whether teaching practice could improve children's perceptions of animals with a bad image. For this purpose, children from the 5th year of schooling approached the topic "diversity of animals" differently. The experimental group, 50 children from three classes (25 boys and 25 girls) aged 10 to 13, adopted an approach more focused on the role of the ecosystem and benefits of the animals for humans. The control group, 53 pupils from another three classes (27 boys and 26 girls) within the same age range, adopted a more descriptive approach based on the morphology, physiology and behaviours of the different animals. A pre-test and a post-test were administered to identify children's empathy with ten animals with a bad image and to assess both their attractiveness and dangerousness. The experimental group significantly increased their empathy with the ten animals and only the assessment of their dangerousness was less conclusive. Even so, the dangerousness of the shark and of the mouse decreased significantly in this group. The research seems to be important as an aid to the design of didactic approaches related to the present issue both in continuous and pre-service training courses for primary teachers.*

**Keywords:** *perceptions of animals, primary school, teaching practice.*

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## CHANGING NEGATIVE PERCEPTIONS OF ANIMALS THROUGH TEACHING PRACTICE: A RESEARCH IN PRIMARY EDUCATION

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### Introduction

All humans have different perceptions of animals and a varied range of feelings towards them. For Joy (2010), these different forms of looking at animals depend on a psychological framework schema, a kind of structure that organizes and interprets incoming information. For instance, it is this schema that allows us to classify an animal as edible or not, as prey or predator, or as friendly or not.

The consumption of animals as food is an excellent example of the way this schema works. Dogs are considered as pets but cows are to be eaten, since we have a different perception of these two animals. Yet, biologically, dogs and cows are quite similar in their complexity, having feelings, preferences, and consciousness (Joy, 2010). However, in another culture, the schema may be the opposite; dogs can be seen as food and cows as animals that it would be unthinkable to include in our diet. That is why Joy (2010) states, that "how we feel about an animal and how we treat it, it turns out, has much less to do with what kind of animal it is than about what our perception of it is" (p. 6).

These perceptions are strongly influenced by culture, traditions and beliefs rooted in every society, but they are not immutable and do not necessarily occur in every member of a particular culture. Events in human history were sometimes responsible for some of the changes in the perception of a particular animal. For instance, as Marvin (2012) claims, with the domestication of sheep and goats, the wolf came to be seen as a worthy rival, an unwanted animal that is responsible for damaging human affairs. This negative perception persisted for centuries and, even recently, Kellert (1985), in a survey involving more than three thousand Americans from 48 states, concluded that the wolf was one of the least liked animals due to its predatory nature, damage to property, especially cattle, and cultural and historical negative image. But as Midgley (1995) points out, studies of animal behaviour have shown that the wolf is an animal with great affection and loyalty towards its parents, great courage in adversity and a predator that kills only what it needs to survive. This scientific knowledge has had a positive im-



pact on perceptions of the animal, revealing features that humans would like to be able to achieve, and the subject of texts in which wolves become an inspiration for humans' lives (see, for instance, Rowlands, 2008; Towery, 2009).

Other examples could be given related to other animals, such as the shift in the perception of primates during the twentieth century from strange creatures to animals with a complex cognitive capacity and social abilities (Arluke & Sanders, 1996).

However, the perception of a particular animal does not always acquire a universal character, as previous stated. For instance, in a research project by Prokop, Usak & Erdogan (2011) involving children from Slovakia and Turkey showed that the Turkish children had a more positive perception of wolves, manifested less fear of these animals and a greater understanding of their condition as predators. These differences may be related to cultural matters: wolves had a positive role in a legend related to the identity of the Turkish nation. But perhaps one of the best-known cultural discrepancies is highlighted by Passariello (1999) and related to cows, since in Hindu groups in India and by the Maasai, in East Africa, they are revered animals while in western countries they are regarded in a merely instrumental way. Indeed, India is a country where worship of certain animals has existed for centuries. Besides the cow, other animals like the monkey, the tiger, the rat, the elephant, or the snake are considered sacred (Kala & Sharma, 2010). This worship may have developed for religious reasons, related with the idea of humans' reincarnation in a certain animal in future lives, but it can also be caused by the need to sustain natural resources or even to achieve ecological balance. For instance, snakes can eat rodents that destroy crops.

Finally, perceptions also vary within the same culture. Factors such as age, gender and academic qualifications are determinant in this variation. Ecological literacy, especially, is also an important factor that can attenuate adverse attitudes and behaviours towards animals (Almeida, Vasconcelos & Strecht-Ribeiro, 2014).

Children, during their formal education, reflect the perceptions of animals which are normally most frequent in their culture. Some of these negative perceptions are in part akin to misconceptions, since they are resistant to change by conventional teaching strategies (Prokop, Fančovičová, & Kubiátko, 2009), and often come into conflict with aspects of a scientific nature. Misinterpretations of the behaviour of animals are frequent, as in the case of the considered "dirty" mud baths of pigs and boars, a way used by these animals to protect their skin from the sun, to remove parasites or to regulate body temperature. That is why scientific literacy can contribute to a better understanding of animal behaviours, helping to rebuild ingrained negative cultural perceptions. This literacy can even help children by raising awareness of the decline of biodiversity, contributing to the preservation of different species and habitats on earth.

#### *Research Focus*

This research started with the following question: Can teaching practice help to develop in learners from the 5<sup>th</sup> year of schooling more positive perceptions of animals with a bad image?

In attempting to answer this question, the following research objectives were set:

- a) to identify the level of children's empathy with the following ten vertebrates: the wolf, the vulture, the bear, the bat, the fox, the shark, the crocodile, the boar, the snake and the mouse.
- b) to assess the attractive and the dangerous aspects of the above-listed animals.
- c) to assess eventual changes in children's perceptions of the animals listed after studying the topic "diversity of animals" from two different didactic approaches.

Several studies have tried to identify the perception of humans of different cultures and ages of different animal species. Kellert (1989) was a pioneer in this line of research. In one of his first studies, with a sample of 3000 American adults, he found that the favourite animals were two domestic animals, the dog and the horse, and the two most under-appreciated ones were insects, the cockroach and the mosquito. Other animals, such as the wolf, the vulture, the bat or the shark were also seen negatively but also obtained a strong standard deviation in terms of the empathy they generated in the respondents.

Since then, other studies have been carried out in countries as diverse as Australia, Italy, Norway, Slovakia and Switzerland with samples ranging from kindergarten children to adults (see, for instance, Driscoll, 1995; Bjerke & Ost Dahl, 2004; Prokop & Tunnicliffe, 2008; Schlegel & Rupf, 2010; Borgi & Cirulli, 2015). In general, the results of these studies show the same tendencies. Normally, the respondents prefer mammals and birds, especially pets or domestic animals; reptiles, amphibians and invertebrate animals are almost always negatively perceived. The reasons for the negative or positive perceptions of animals tend to be very simplistic and can be organized in two



groups: the “good” and the “bad” animals (Arluke & Sanders, 1996). But other studies report more specific reasons as size, aesthetics, intelligence and phylogenetic relatedness to humans (Knight, Nunokoosing, Wrij & Cherryman, 2003; Herzog 2010; Borgi & Cirulli, 2015), morphological and behavior aspects (Hillman 1991), emotion of disgust (Prokop et al., 2016), danger to humans (Curtis, Aunger & Rabie, 2004; Løe & Röskaft, 2004), or predatory tendencies related to danger to humans and ability to cause damage (Schlegel & Rupf, 2010), just to mention a few.

More recently, in Portugal, this issue has also been approached (see Almeida, et al., 2014; Almeida, Lança, & Gonçalves, 2014; Ceriaco & Marques, 2013). The first of these studies was carried out with 210 urban children, aged 8 to 10, and had two main objectives: a) to identify the perceptions of primary school children of 25 animals; b) to determine the relationship between that perception and the desire to save the animals if they were threatened with extinction. The five animals most appreciated by the children were the horse, the dog, the turtle, the butterfly and the swan, and the least appreciated, the cockroach, the mosquito, the rat, the snake and the bee. Their justifications were essentially: a) the aesthetics of the animals; b) their positive interaction with humans and absence of dangerousness; c) aspects of their morphology, locomotion and behaviour; d) the fact that they were domestic animals or pets. The economic value of the animals and their symbolic and ecosystemic value were also mentioned by the children, but less often. In this study, a positive correlation was also found between empathy with an animal and the willingness to save it in from extinction. Even so, almost 20% of the children would save an animal even without liking it, since they revealed recognition of its intrinsic or ecosystemic value.

The second study was similar to the one already presented, but it tried to compare the children’s perception of the same 25 animals with the ones of primary school pre-service teachers. To this end, the same questionnaire was administered to both samples and the results were very similar in relation to the most and least liked animals and also to the ones with a higher standard deviation. Domestic animals were the most liked animals and reptiles and insects the least.

Finally, the third study by Ceriaco & Marques (2013), who investigated myths about geckos and human behaviour towards them, was particularly important, since it contained a plan of action. This study was implemented in the south of Portugal and sought to identify the perceptions of children, aged between 4 and 8 years, of geckos. Before the plan, most of the children considered geckos as “poisonous” and “dangerous”, responsible for skin diseases, and without utility or beauty. This perception, according to the authors, reflects the image of the people of the south of Portugal of these animals, an image that is also common in Arabic countries such as Morocco, Egypt and Pakistan, suggesting a perception that had its origin through folklore.

Medina and Atran (2004) state that folklore can manifest itself through legends, songs, oral stories, proverbs, beliefs and habits, which reveal the traditions of a culture, subculture, or group. All these forms of diffusion promote the transmission of these ideas from person to person and from generation to generation, through oral tradition or by behaviour imitation. In this case, these ideas regarding geckos have been responsible for the death of many animals, due to the fact that they live in close proximity to humans, since they climb house walls and other buildings, searching for insects, their main food.

But this study also included, as has already been mentioned, a plan of action with several sessions in order to change the negative perceptions of children of these animals. The resources used for this purpose were: a) a children’s story about geckos, b) slideshows with cartoons and real images of the two most important species of gecko in Portugal, the Mediterranean gecko and the common gecko, to better explain their differences in morphological, ecological and biological terms. The results demonstrate that these resources, focused on the bio-ecological aspects of geckos, were effective in considerably improving children’s positive perceptions of these animals (Ceriaco & Marques, 2013).

## Methodology of Research

### *General Background*

As already mentioned, the main focus of the present research was to identify the perceptions of ten animals in primary school children and to determine whether formal education could bring about a change in these perceptions. To this end, the methodological approach had a quasi-experimental design, implemented to compare the results of the experimental group with the ones from the control group. Despite the quantitative approach of the research, qualitative techniques were used to treat certain data. The research was implemented in two different academic years: 2014/2015 and 2016/2017.



The initial research, in 2014/2015, was part of the “teaching practice project” of one of the members of the research team, a curricular unit that is included on a master’s course qualifying students to be teachers in the first two cycles of schooling in Portugal (the first 6 years, children’s age between 6 and 12). Since the initial sample was too small, with only two classes, the intervention was repeated in four more classes in 2016/2017. But, as Pole & Lampard (2002) maintain, independently of the size of the sample, this kind of research is particularly useful for assessing the impact of a specific form of intervention, and can help the design of other teachers’ activities related to the same subject.

### *Research Sample*

The experimental group consisted of a group of 50 learners from 3 classes (25 boys and 25 girls), aged between 10 and 12. The control group was composed of 53 pupils from another three classes (27 boys and 26 girls), in the same age range. The children from all the classes involved attended the 5<sup>th</sup> year of schooling at a primary school in a suburban area of Lisbon, Portugal. Both groups, the experimental and the control group, shared some similar features. The children lived in the proximity of the school and exhibited considerable cultural diversity. Some families were from Portuguese-speaking countries in Africa, especially Cape Verde and Angola. The socioeconomic level of the families was medium / low, with low academic qualifications. The six classes involved in the research consisted of 111 learners but only 103 were present in all phases of the research plan. The school belongs to a large group of schools included in the Educational Territories for Priority Intervention Programme, a programme designed to help economically and socially disadvantaged territories, characterized by poverty and social exclusion, where violence, indiscipline, dropout and under-achievement are most prevalent. Schools in this programme always have classes of no more than 20 learners and enjoy extra educational resources (for instance, tutorial support in Mother Tongue Language and Maths). In the latest assessment made by the Ministry of Education during 2016, the school obtained results comparable with those of similar schools included in the Programme, a reason to consider the present school representative of this kind of territory.

### *Instrument and Procedures*

The Science syllabus in the 5<sup>th</sup> year of schooling is focused on the living world in relation to the topic “diversity of animals”. It has the following objectives: a) to interpret the characteristics of organisms according to their environments; b) to understand the diversity of animals’ diets considering the habitat where they live; c) to understand the diversity of the reproductive processes of animals; d) to understand the influence of abiotic factors on morphological and behavioural adaptations of animals; e) to understand the importance of protecting animal biodiversity (Ministério da Educação e Ciência, 2013). Due to these aims, it was considered the year of schooling most relevant to the implementation of the present research.

The pre-test and post-test consisted of the same questionnaire, which included two independent parts and started by asking the children’s gender, age and school class. In the first part, the children were invited to evaluate and justify their empathy of ten animals, using a scale from 1 to 5, 1 being the lowest level of empathy and 5 the highest. The ten animals included in the questionnaire were selected from among those with a bad image in the results of the studies of Kellert (1989) and Almeida et al. (2014), already quoted. However, since their number was more than ten, the final selection was made according to the animals that figured most in the children’s textbook. The animals selected were: the wolf, the vulture, the bear, the bat, the fox, the shark, the crocodile, the boar, the snake and the mouse. In the second part, each learner was asked to assess the attractiveness and dangerousness of each animal. To this end, they had to choose between the following pairs of characteristics: attraction / repulsion; not dangerous / dangerous. Since the second part of the questionnaire might give the children ideas as to how justify their empathy with a certain animal, each part of the questionnaire was administered separately.

The children’s reaction during the administration was very good and they showed that they were focused on the task. They only expressed some difficulties in justifying their empathy with a particular animal. But in these cases the children were strongly encouraged to look for a reason.

After the administration of the pre-test in the first intervention, the results showed that the three animals with the worst ranking in the experimental group were the mouse, the vulture and the shark. Therefore, the intervention was centred on these animals. This intervention was carried out in four non-sequential periods and started with a general presentation concerning the importance of biodiversity and the explanation of what is meant by the



extinction of species. The following steps dealt with each animal separately, but always including the following points: (a) main characteristics of the animal, (b) ecosystem role, (c) benefits for humans, (d) inspiration for humans, and (e) interesting points.

In each session, a slide presentation was shown. These presentations paid special attention to the quality of the images of the animals presented, since a visual approach seems to help increase children's willingness to protect them (Štefaníková & Prokop, 2013). Furthermore, scientific information was included as well as several discussion questions. It was followed by the discussion of texts and short films from YouTube. Both resources sought to underline the relevance of each animal in the ecosystems and also its importance for humans. The selection of the resources also sought to increase the learners' empathy with the animals and their attractiveness, and to relativize their dangerousness by stressing, in the case of dangerousness, that animals normally only attack humans when they feel threatened or when their habitat is invaded. The texts were written based on information from various internet sources. They were firstly discussed in pairs and then the discussion was extended to the whole class.

It should be noted that the control group also experienced the syllabus contents through slide presentations and textbook activities. However, it was not put through a teaching / learning process directly related to the attempt to improve the perception of certain animals with a bad image. But the resources used with both groups tried to contribute to the achievement of the learning aims as defined by the Minister of Education.

The steps of the study are summarized in Table 1. Each one lasted on average 45 minutes and the whole process took place from December 2014 to March 2015, in the case of the first intervention, and from January 2017 to April 2017, in the case of the second intervention due to the need to extend the initial sample, a situation already explained.

**Table 1. The various steps of the present research study involving the Experimental Group (EG) and the Control Group (CG).**

Steps of the research	EG	CG
Pre-test	X	X
Extinction of animals (Slide presentation)	X	
<b>The mouse</b> -Slide presentation with a number of mouse features; -Discussion of the texts: "Trained rats detect tuberculosis"; "Rats in the environment".	X	
<b>The shark</b> -Slide presentation with a number of shark features; -Discussion of the text "Why defend sharks?"; -Presentation of the Youtube film "Shark Finning Cruelty".	X	
<b>The vulture</b> -Slide presentation with a number of vulture features; -Discussion of the text "European vultures face a huge and recent threat"; -Presentation of the Youtube film "Deadly Danger for Europe's Vultures".	X	
Post-test	X	X

### Data Analysis

Inferential statistics using SPSS programme was used to compare the qualitative data obtained from the two groups, with a level of significance of  $p < 0.05$ . For each group of participants, each animal obtained an average based on a 1 - 5 rating assigned by each participant. After that, an average for the 10 animals included in the questionnaire, and an average for the three that were the object of treatment, were calculated. All these averages were statistically compared between the experimental group and the control group, applying the Mann-Whitney U test for independent samples to test the homogeneity of the two groups in the pre-test. For comparing the results of each group at the pre-test and post-test stages, the Wilcoxon test for dependent samples was used. The choice of these tests took place after a prior application of the Kolmogorov-Smirnov test to determine the normal distribution of data, since the sample had more than 50 participants. To check the attractiveness and the dangerousness of the ten animals, the two groups were also compared at the first stage (pre-test) and at the second stage (post-test). A chi-square test was then used due to the dichotomous nature of the variables.



The categorization of the reasons given by the children for disliking the vulture, the shark and the mouse was done *a posteriori* based on the main focus of their answers. The categories that were found were the following: aesthetics; morphological, physiological and behavioural aspects of the animals; danger to humans; media image; inflicting property damage; experiences and personal feelings; myths and beliefs.

#### Validity and Reliability

The questionnaire was validated by two experts from the field of science education based on the following criteria: i) the main aims of the present study; ii) awareness of the reasons for the inclusion of the ten animals chosen; iii) awareness of other questionnaires from similar studies. The questionnaire was piloted with ten children from the same year of schooling and with the same social features and school performance. Special attention was paid to the difficulties related with the syntax of the sentences included, due to the fact that the children from this school show a low performance in the Mother Tongue.

This prior administration was also important to check the time necessary to complete the task. During the administration of the sample, only questions related to the understanding of the questionnaire were answered. Oral comments and the exchange of ideas between pairs were discouraged. The codification of the reasons for disliking the three animals that were the object of intervention was done by the three authors separately and then compared. The categories found were similar to those of other studies already quoted. The children did not elaborate on their justifications, and the reasons were always a short statement or an adjective. This fact also helped the categorization mentioned before.

The experimental group showed a huge receptiveness to the activities set, even considering the difficulties in understanding the main ideas from the texts. They expressed a great interest in the discussion activities, which was considered an indicator of the suitability of the resources designed. Even so, it was impossible to explore in greater depth the didactic resources specially designed for the intervention due to limitations of time related to the necessity to approach other topics of the syllabus.

#### Results of Research

The results related to the preferences of the pupils from both groups of the ten animals present in the questionnaire, including the three that were object of intervention in the pre-test, are shown in Table 2.

**Table 2. The level of empathy (average and standard deviations) obtained by each animal in the Experimental Group (EG) and Control Group (CG) in the pre-test. The names of the animals chosen for intervention in the EG appear in bold.**

Animal	EG		CG		Mann – Withney U	p
	M	SD	M	SD		
Wolf	3.48	1.199	3.13	1.271	1114.0	.153
Fox	2.90	1.474	2.88	1.254	1092.0	.113
Bear	3.66	1.153	3.33	1.208	1117.5	.151
Bat	2.90	1.474	2.88	1.368	1323,0	.989
Boar	2.76	1.221	2.81	1.193	1296.0	.844
Crocodile	2.42	1.263	2.18	1.316	1147.0	.221
Snake	2.20	1.340	2.03	1.285	1233.0	.520
<b>Shark</b>	2.32	1.376	2.15	1.419	1204.5	.402
<b>Vulture</b>	1.92	0.944	2.39	1.182	1027.0	<b>.040</b>
<b>Mouse</b>	2.30	1.446	2.20	1.276	1319.5	.970
Total-3	6.54	2.620	6.71	2.514	1265.5	.692
Total-10	27.58	7.842	26.39	7.445	1184.5	.353



Before the intervention, the two groups were comparable concerning their empathy with the ten animals. The differences between the averages for the ten animals taken together and for the three which were the object of intervention were not statistically significant. In the analysis for each animal, the two groups were only statistically different in the case of the vulture. Even so, the average for this animal in both groups was very low, but not so low in the control group. The highest values of standard deviation were observed in the experimental group towards the fox, the bat and the mouse.

The comparison of the results for the two groups after the different didactic approach concerning the topic "diversity of animals" is included in Table 3.

**Table 3. Comparison of the empathy level (average and standard deviations) obtained by the different animals in the Experimental Group (EG) and in the Control Group (CG) in the pre-test (Stage 1-S1) and in the post-test (Stage 2-S2) after the different didactic approach to the topic "diversity of animals".**

Animal	Experimental Group (EG)						Control Group (CG)					
	S1	SD	S2	SD	Z	p	S1	SD	S2	SD	z	p
Wolf	3.48	1.199	3.90	1.092	-2.058	.040	3.13	1.271	2.98	1.393	-0.756	.450
Fox	2.90	1.474	4.22	0.840	-2.466	.014	2.88	1.254	3.32	1.326	-0.530	.596
Bear	3.66	1.153	3.90	0.886	-0.815	.415	3.33	1.208	3.41	1.231	-0.561	.575
Bat	2.90	1.474	3.62	1.243	-2.663	.008	2.88	1.368	2.67	1.516	-1.028	.304
Boar	2.76	1.221	3.24	1.407	-2.012	.044	2.81	1.193	2.73	1.195	-0.759	.448
Crocodile	2.42	1.263	2.90	1.501	-2.297	.022	2.18	1.316	2.26	1.258	-0.341	.733
Snake	2.20	1.340	2.86	1.414	-2.676	.007	2.03	1.285	2.18	1.345	-0.947	.344
<b>Shark</b>	2.32	1.376	3.52	1.281	-3.919	.001	2.15	1.419	2.39	1.548	-1.245	.213
<b>Vulture</b>	1.92	0.944	3.32	1.252	-4.986	.001	2.39	1.182	2.15	1.150	-1.485	.138
<b>Mouse</b>	2.30	1.446	3.64	1.410	-4.433	.001	2.20	1.276	2.13	1.330	-0.676	.499
Total-3	6.54	2.620	10.48	3.150	-5.420	.001	6.71	2.514	6.67	2.998	-0.387	.699
Total-10	27.58	7.842	35.12	8.072	-4.971	.001	26.39	7.445	26.26	9.251	-0.139	.890

In the experimental group all the average differences are statistically significant between the two stages, with the exception of the bear. But this exception cannot be seen as a bad result considering that this animal scored in the two stages one of the highest rankings in both groups. These differences arise from the increase in the average obtained by each animal in the post-test by the experimental group. But a very interesting result was the fact that the increase in these averages did not happen only with the three animals that were object of intervention, but also occurred with all the animals. In this same group the standard deviations for each animal decreased in the majority of the cases but in two of the three animals that were the object of intervention, they remain with similar values.

In the control group, the differences in the averages obtained between the two stages were not statistically significant. Some increased but others decreased, without showing any consistent trend. The average calculated for the three animals and for the ten animals all together revealed the same tendency. In this same group the standard deviations for each animal increased slightly in the majority of cases.

The reasons for disliking the three animals chosen for intervention are included in Table 4. The negative arguments about the animals were classed in the several categories already introduced in the methodology section. Aesthetics, danger to humans and morphological, physiological and behavioural aspects of the animals are those that include the majority of the reasons mentioned by the learners. However, these negative reasons also decreased substantially in the experimental groups at the second stage.



**Table 4. Reasons given by the children of both groups for disliking the animals chosen for intervention in the pre-test (Stage 1 – S1) and in the post-test (Stage 2- S2).**

	Vulture				Shark				Mouse			
	EG		CG		EG		CG		EG		CG	
	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
<b>Aesthetic</b>	17	7	13	7	-	3	-	-	2	2	9	6
-Ugly	17	7	13	7	-	3	-	-	2	2	9	6
<b>Morphological, Physiological and Behavioural aspects</b>	10	1	13	21	4	-	10	7	4	-	1	-
-It is (too) small	-	-	-	-	-	-	-	-	2	-	1	-
-It is big /It has a big neck	-	-	2	4	-	-	2	1	-	-	-	-
-It jumps a lot	-	-	-	-	-	-	-	-	2	-	-	-
-I do not like birds	-	-	1	1	-	-	-	-	-	-	-	-
-It eats dead bodies	9	1	10	16	-	-	-	-	-	-	-	-
-It eats/kills other animals	-	-	-	-	2	-	2	1	-	-	-	-
- It has a lot of sharp teeth	-	-	-	-	-	-	5	2	-	-	-	-
- It is aggressive	1	-	-	-	2	-	1	3	-	-	-	-
<b>Danger to humans</b>	4	1	2	2	26	7	27	26	6	1	8	13
-It can attack/kill us	4	-	2	2	26	7	27	26	-	-	-	-
-It can transmit diseases	-	1	-	-	-	-	-	-	6	1	8	13
<b>Media image</b>	-	-	-	-	1	-	-	-	1	-	-	-
-It is evil in the movies	-	-	-	-	1	-	-	-	1	-	-	-
Inflicting property damage	-	-	-	-	-	-	-	-	11	2	2	2
-It invades houses	-	-	-	-	-	-	-	-	10	2	2	1
-It gnaws everything	-	-	-	-	-	-	-	-	1	-	-	1
<b>Experiences and personal feelings</b>	7	3	5	8	5	3	5	7	7	5	20	15
-It provokes fear	-	-	2	1	3	3	3	6	-	-	4	1
-It is disgusting	6	2	2	-	-	-	-	-	7	5	12	14
-It bites me	-	-	-	-	-	-	-	-	-	-	1	-
-It is evil	1	1	1	7	2	-	2	1	-	-	3	-
<b>Myths and beliefs</b>	2	-	-	-	-	-	-	-	-	-	-	-
-It eats dead people	2	-	-	-	-	-	-	-	-	-	-	-
I do not like it	3	1	3	2	-	1	-	-	-	2	-	4
Total	43	13	36	40	36	14	42	40	31	12	40	40

Even knowing that the children do not really elaborate on their reasons for disliking the animals, they are clear enough to get an idea of the causes that lead to a negative perception of a particular animal. The incidence of negative reasons decreased in the experimental group in the post-test. The reasons were mainly from four categories: aesthetics of the animal, morphological, physiological and behavioural aspects, danger to humans and experiences and personal feelings. The shark was seen as particularly dangerous and the vulture was seen negatively due to its habit of eating 'dead bodies', a reason that persisted in the control group in the post-test.

In relation to the attractiveness and the dangerousness of each animal, the two groups were firstly compared in the pre-test (Table 5).





**Table 5. Frequencies obtained by each animal concerning their attractiveness and dangerousness in the Experimental Group (EG) and in the Control Group (CG) in the pre-test. A chi-square test ( $\chi^2$ ) was used to verify the homogeneity between groups before the intervention.**

First moment (pre-test)								
	Attraction (A) / Repulsion (R)				Not Dangerous (ND) / Dangerous (D)			
	EG (A/R)	CG (A/R)	$\chi^2$	<i>p</i>	EG (ND/D)	CG (ND/D)	$\chi^2$	<i>p</i>
Wolf	38/12	27/26	6.938	.008	10/40	40/43	0.021	.885
Vulture	10/40	19/34	3.195	.074	14/36	28/25	6.568	.010
Bear	37/13	36/17	0.460	.498	13/37	15/38	0.069	.793
Bat	23/27	24/29	0.005	.942	31/19	29/24	0.561	.454
Fox	41/9	35/18	3.389	.066	24/26	30/23	0.764	.382
Shark	14/36	11/42	0.735	.391	2/48	5/48	1.199	.438
Crocodile	12/38	9/44	0.781	.377	5/45	2/51	1.557	.261
Boar	20/30	25/28	0.538	.463	20/30	20/33	0.056	.814
Snake	11/39	12/41	0.006	.938	3/47	5/48	0.424	.716
Mouse	19/31	16/37	0.700	.403	37/13	37/16	0.223	.637

In the assessment of the dangerousness and attractiveness of the animals in the 1<sup>st</sup> stage, the two groups did not reveal statistically significant differences with the exception of the wolf, an animal that was seen by the experimental group as more attractive, and of the vulture, which was also seen by the control group as less dangerous.

The comparison of the results of the two groups concerning the attractiveness and the dangerousness of the animals in the post-test is included in Table 6.

**Table 6. Frequencies obtained by each animal concerning their attractiveness and dangerousness in the Experimental Group (EG) and in the Control Group (CG) in the post-test. A chi-square test ( $\chi^2$ ) was used to verify the homogeneity between groups after the intervention.**

Second moment (post-test)								
	Attraction (A) / Repulsion (R)				Not Dangerous (ND) / Dangerous (D)			
	EG (A/R)	CG (A/R)	$\chi^2$	<i>p</i>	EG (ND/D)	CG (ND/D)	$\chi^2$	<i>p</i>
Wolf	44/6	27/26	16.497	.001	24/26	13/40	6.158	.013
Vulture	30/20	14/39	11.860	.001	28/22	24/29	1.182	.277
Bear	44/6	36/17	5.979	.014	19/31	16/37	0.700	.403
Bat	27/23	21/32	2.137	.144	36/14	31/22	2.065	.151
Fox	44/6	33/20	9.030	.003	36/14	34/19	0.728	.394
Shark	33/17	9/44	25.599	.001	18/32	3/50	14.591	.001
Crocodile	20/30	7/46	9.548	.002	9/41	2/51	5.459	.019
Boar	29/21	21/32	3.479	.062	28/22	24/29	1.182	.277
Snake	20/30	12/41	3.620	.057	12/38	6/47	2.868	.090
Mouse	33/17	16/37	13.229	.001	44/6	28/25	15.126	.001



In the experimental group, not only the three animals chosen for intervention were considered much more attractive, but also all the others included on the questionnaire (compare also the results presented in Tables 5 and 6). The results of the control group were very similar in both stages, even decreasing a little for several animals in the post-test. Statistically, the differences between the two groups were significant for seven of the ten animals, with more two near the level of significance.

Turning now to the assessment of the dangerousness of the ten animals, the experimental group decreased its negative perception for all the animals, especially in the case of the shark and the vulture, which had had very high scores in the pre-test. The mouse was considered from the first stage as a harmless animal, a quality that was maintained at the second stage. In the control group, only the mouse decreased this negative perception. Statistically, the differences between the two were significant only for the following animals: the shark, the crocodile, the mouse and the wolf.

## Discussion

The results of this research are in line with other studies, confirming the bad image of certain animals. In fact, only the bear, the fox and the wolf obtained the best initial rankings, in the first stage of the research, thus confirming a higher empathy to certain mammals, some of them increasing their popularity in recent decades. This is the case of the wolf discussed in the introduction section, especially in urban populations.

The results also show that teaching practice can have a role in changing, at least in part, the negative perceptions of animals with a bad image, as was highlighted in other studies (see, for instance, Lindemann-Matthies, 2005; Prokop & Tunnicliffe, 2008; Prokop, Tolarovicová, Camerik, & Peterková, 2010). However, it only partially reinforces Kellert's (1996) belief that education can be the most powerful force in shaping perceptions of nature, since this shaping seems more dependent on the didactic approaches selected by teachers.

Globally, the image of the three animals chosen for intervention improved significantly, but also the image of all the animals included in the questionnaire. This effect of transference is a very relevant result, since children start to look at all animals in a more positive way, maybe because they now consider that all of them must have a role in nature or a usefulness for us, even without knowing precisely what that usefulness is in each case. A similar transference involving children from the same age range as the present research was found by Prokop & Fančovičová (2017), who concluded that the use of snails in hands-on activities reduced children's disgust with these animals but also with other "disgusting" animals like earthworms, mice and snakes.

For this change, it seems not enough just to approach the main features of animals related to their morphology, physiology or adaptive behaviour in the ecosystems, as occurred in the control group. In fact, Tomazic (2011), in one of his studies, came to a similar result involving future teachers' perceptions of snakes: "Although pre-service teachers were more knowledgeable about snakes, their willingness to act pro-environmentally and the negativistic attitudinal dimension did not significantly differ from the ratings of primary school pupils" (p. 168).

Consequently, it seems necessary to discuss the importance of each animal's role in the ecosystem, and, when possible, its direct or indirect importance to humans. Through this approach, it is possible to highlight how life is intrinsically interconnected, also showing the reason for the behaviours of certain animals frequently misinterpreted as being dangerous or disgusting, as is the case of the vulture necrophagous. Due to the success of the intervention related to the shark, it also seems that children's awareness of situations in which an animal is badly treated by humans can also develop an empathy to that animal, as was the case with the presentation of the Youtube film "Shark Finning Cruelty".

The present intervention, which stresses the usefulness of animals to humans, can be considered controversial, since it seems to accentuate an anthropocentric vision of nature linking preservation with the instrumental value of each life form. Wilson (1993), for instance, is a great advocate of this approach, since he considered that instead of appealing for the innate rights of species, it would be more effective to highlight how diversity of life is so important to our own survival in several dimensions: utilitarian, emotional, spiritual and cognitive integrity. But for Batt (2009), anthropocentrism is responsible for the way animals of different species are valued, with consequences in terms of their conservation, research, public interest and even ef-



forts to guarantee their own rights or welfare. Based on these different opinions, a balance in using a wider range of arguments was achieved, stressing the value of each species in the ecosystem and also highlighting violent acts performed by humans on other animals.

The only result that was less conclusive was the global perception of the dangerousness of the different animals. In fact, as quoted by Davey et al. (1998), several animals may attack us thus inspiring fear as in the case of sharks. Even so, Seraphin (2010) points out how a shark attack is normally exaggerated, since its probability is lower than the risk of death caused by a bee sting or a car accident. But other kinds of fears are much less rational and exaggerated, since the actual presence of dangerous animals (poisonous or otherwise), in most European countries, quite rare. Also, the idea that animals can attack humans for no reason is still very ingrained in children. And a way to a better assessment of animals' dangerousness may be achieved by showing that, in the majority of cases, animals are reacting to human invasion or destruction of their habitats, ideas that were present during the intervention but that should be further developed.

Thus, future interventions with the same purpose of the present research should pay more attention to the dangerousness of the animals and seek more clearer-cut strategies to deal with this issue. Perhaps the use of practical work with some of the animals that inspire fear and disgust, a strategy used with success in other studies (see, for instance, Randler, Hummel & Prokop, 2012; Prokop & Fančovičová, 2017), or the implementation of outdoor activities to develop greater empathy with less popular animals, like trials promoted by non-formal associations to observe vultures, might be successful aids. Even so, the recognition of the dangerousness of certain animals did not affect the other factors under analysis, which is an important finding.

Finally, it is important to point out that all the children's changes were checked fifteen days after the intervention. Indeed, it will be important to assess the stability of these changes and to identify conditions that might better promote that stability, aspects that need further research.

## Conclusions and Implications

The didactic intervention focused on three animals with bad image addressing its ecosystem role and benefits and inspiration for humans, had an impact not only improving the perception of children of these three animals, but also of other seven that were not specifically addressed. The results of the present research are important for reflection on the best educational strategies to highlight the importance of biodiversity and enhance the relevance of the different species, including those that generate less empathy in humans.

The present research may also trigger future interventions related to other groups of animals with a bad image, for instance, invertebrates, amphibians and reptiles since it is essential to develop in children a broader empathy to other species, regardless of their complexity and their evolutionary proximity to humans.

To these aims it is essential that teachers do not replicate dominant negative perceptions of certain animals during their teaching practice, thus enabling the change effect that the educational process can promote. Therefore, some work on pre-service and continuous teacher training courses related to the present issue is also necessary.

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