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Interest in Birds and its Relationship with Attitudes and Myths: A Cross-cultural Study in Countries with Different Levels of Economic Development

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Abstract

Birds are one of the most important species that can help protect biodiversity. Although birds are important beings for biodiversity and human existence, there is a relatively less quantity of research that has investigated the interest in and attitudes toward birds. This study aims to investigate the knowledge level of and attitudes toward birds among students in countries at different levels of economic development. To collect the data, a Bird Knowledge Questionnaire and a Bird Attitude Questionnaire were developed and used by the researchers in this study. These questionnaires were administered to a total of 852 students from different countries, including Colombia, Germany, Slovakia, and Turkey. The results obtained in this study showed that Colombian students had the highest interest in birds as compared to students in Slovakia, Turkey, and Germany. Girls had consistently higher interest in birds than boys in all countries, but there were no gender differences in the cognitive domain. Our research suggests that factual knowledge about birds is not a necessary prerequisite for interest in birds, but animal-related activities show strong associations with an interest in birds.

Keywords: Attitudes • Birds • Cross-cultural study • Myths • Science education

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There are more than 10,000 bird species worldwide, and birds are often used as flagship species for environmental and nature conservation purposes because they appeal to most people in developed countries (Randler & Bogner, 2006). However, birds can also be seen either negatively as pest species (e.g., weaver birds; Ploceidae; Ward et al. 1979), or positively as pollinators or insect feeders (Jones & Sieving, 2006; Klein et al., 2007) or as food (Meiklejohn, 1962). In this study, we addressed the interest in birds and its relationship to other variables (attitudes, knowledge, animal-related activities, and culture). In the following literature overview, we discuss all these aspects.

Role of Interest

Interest is one of the most powerful variables in explaining achievement and motivation in learning and instruction and in educational research in general (Hidi, 2006; Schiefele, Krapp, & Wintelar, 1992). Interest is also a facet (among others) of intrinsic motivation within the context of the self-determination theory (Deci & Ryan, 1985). Interest is often related to achievement (Christidou, 2011; Hummel & Randler, 2012; Randler & Bogner, 2007), and high interest is believed to lead to high academic achievement.

Concerning gender differences in adolescents in biological education, Jones, Howe, and Rua (2000) found that among sixth-grade students, girls were more interested in AIDS and in eating to stay healthy, while boys were more curious about technical issues. In elementary schools, boys preferred the physical sciences, while girls the biological sciences (Adamson, Foster, Roark, & Reed, 1998). Researchers have reported that, in general, girls expressed a greater interest in biology (Dawson, 2000; Prokop, Tuncer, & Chudá, 2007; Uitto, Juuti, Lavonen, & Meisalo, 2006). However, some studies found no gender differences in the interest in and the attitudes toward biology. For example, third and fourth grade boys and girls did not differ in their interest in amphibians (Randler, Ilg, & Kern, 2005), zoology (Randler, Osti, & Hummel, 2012), or biology in general (Uşak et al., 2009). Similarly, no gender differences in self-generated questions were reported about biology, zoology, and botany (Baram-Tsabari & Yarden, 2005). Interest in biology is high in grades 5 and 6, but decreases with older students or upper grade levels (Baram-Tsabari & Yarden, 2005; Prokop, Prokop, & Tunnicliffe, 2007; Prokop, Tuncer, & Chudá, 2007).

Birds are one of the most important species that can help protect biodiversity (Prokop & Rodak, 2009). Although birds are important for biodiversity and human existence, there is relatively less research that has investigated the interest in birds (Prokop, Kubiatko, & Fančovičová, 2008). Moreover, while a decline in the populations of several bird species has been reported in the literature (Butchart, Akcakaya, Kennedy, & Hilton-Taylor, 2006), there is a timely interest in the investigation of children's awareness of birds. Having favorable interests in birds can help protect nature and may promote an interest in science and future science-related careers.

Attitudes toward Birds

Attitude includes indicators of peoples' thinking, feeling, and acting about objects in the environment (Eagly & Chaiken, 1993). Attitudes consist of three components: cognitive, affective, and behavioral (Kaiser, Wolfing, & Fuhrer, 1999). The cognitive component refers to knowledge, the affective-component domain includes feelings, and the behavioral component pertains to actions (Eagly & Chaiken, 1993). Human attitudes toward animals might be influenced by selection pressures (Herzog & Burghardt, 1988) based on the human evolutionary coexistence with animals (predation/food/competition). Human attraction toward animals may depend on the physiological and the communicative similarity between animals and humans. For example, birds are most active during the day, and they use acoustic communication, which makes them "more similar" to humans as compared to fish or reptiles. Furthermore, color perception of humans (trichromatic) and birds (tetrachromatic) are more similar than the vision of most other mammals (dichromatic); thus, colors may also seem to play a significant role in attitudes toward birds (Frynta, Lišková, Bültmann, & Burda, 2010; Prokop & Fančovičová, 2013). Concerning human attitudes toward animals, Serpell (1986, 2004) proposed a motivational framework with two distinct dimensions: affection/sympathy and economic self-interest. The former dimension can be characterized as being similar to indirect, anthropomorphic generalization of responses, as proposed by Herzog and Burghardt (1988). The latter dimension comprises both direct and indirect pressures (Herzog & Burghardt, 1988) because attitudes related to domestication are the result of direct rather than indirect pressures; however, sympathy toward animals would be described as resulting from indirect pressures.

This framework shows that human–animal relationships are still very important although we have developed differently in evolutionary terms and now have less contact with animals. For example, most invertebrates are viewed with aversion, anxiety, and ignorance (Kellert, 1993). Bjerke and Østdahl (2004) found that people most often like small animals such as birds, squirrels, dogs, and so on, and dislike bats, snails, invertebrates, and rats. Some large animals, such as horses or zoo animals, are also considered attractive. Reptiles, amphibians, and insects (with the exception of butterflies) are less appreciated than most mammals and birds (Prokop & Fančovičová, 2013). In another research, Randler et al. (2011) noted that German grade 5 and 6 students found zoological topics more interesting than botanical topics. Liking animals is not a stable trait. For example, a decrease in the liking of animals with increasing age was found by Bjerke, Odegardstuen, and Kaltenborn (1998) and by Prokop and Tunnicliffe (2008). Bogner (1999) examined the effects of conservation programs on 10–16-year-old students' attitudes to, and knowledge of, the Common Swift, *Apus apus*. He found that participants' attitudes did change in two of five environmental dimensions. Regarding gender differences in attitudes toward birds, Prokop, Kubiatko et al. (2008) found that females had higher scores compared to males on the avoidance of birds and interest in birds.

Knowledge and Myths about Birds

In the science literature, there are some studies examining peoples' knowledge of and myths toward birds. For example, Beck, Melson, da Costa, and Liu (2001) found that during an educational home-based program for feeding wild birds, knowledge about birds increased in 7–10-year-old children, but not in 10–12-year-old children. Furthermore, there was no correlation between attitudes and knowledge. Bogner (1999) examined the effects of conservation programs on 10–16-year-old students' knowledge of the Common Swift, *Apus apus*. He found that participants' knowledge about the Common Swift increased only in young children, not in older children. In another research, Prokop, Kubiatko, and Fančovičová (2007) showed that 7–15-year-old children's knowledge about birds is inconsistent and that a substantial number of children have various misunderstandings about bird biology and systematics. In their study, the majority of children (75%) thought that a penguin's body is covered with hair or just skin. About 40% of the children incorrectly classified a penguin as a nonbird species (Kellert, 1985; Trowbridge & Mintzes, 1985) and nearly all (89%) thought that cocks crowed to wake up people or hens (Prokop, Kubiatko, & Fančovičová, 2007). Similarly, Prokop, Tuncer, and Kvasničák (2007) as well as Cardak (2009) found that a significant proportion of learners think that birds migrate to avoid freezing. Kubiatko, Usak, and Pecusová (2011) did find similarly poor knowledge about birds among Slovak 10–15-year-old children in several domains, such as bird reproduction, bird migration, and bird identification. With respect to gender differences, results are not conclusive. Research has revealed that boys had higher wildlife knowledge than girls (Huxham, Welsh, Berry, & Templeton, 2006), but there were no differences in knowledge about birds between males and females, as reported by Prokop, Kubiatko et al. (2008) and Prokop, Kubiatko, and Fančovičová (2007). Kubiatko et al. (2011) found that Slovak girls were more knowledgeable about birds than boys. However, Randler (2008) reported a higher level of animal knowledge in girls, but the difference was minimal.

Current Study

This study aimed to assess interests in, and attitudes and myths about birds with an emphasis on animal-related activities in a sample of adolescent school pupils from four different countries and cultures. We wanted to see if attitudes toward birds differ according to gender, age, and cultures/countries. The research questions that guided this study are as follows:

1. What knowledge is possessed and which attitudes toward birds are held by students in different countries?

2. Are there any differences in the knowledge of, and the attitudes toward, birds with respect to gender?

Educational Contexts of Countries in Science Education

The study was performed in countries with different levels of development. The rankings by GDP per capita for 2012 had Germany at rank 29, Slovakia at 64, Turkey at 90, and Colombia at 110. In the following sections, we provide a brief overview of the teaching and learning of biodiversity and birds in each country.

In Colombia, science educators must teach in compliance with the national curriculum, meaning

that they teach science subjects in accordance with the national education standards However, each school community has autonomy to design and implement an Educational Project addressing the needs, interests, and resources in the school. At the national level, schools also have the opportunity to participate in science education-related initiatives such as The Project Waves, and Little Scientists which are geared towards the promotion of scientific and technological skills. The educational system consists of pre-school, elementary school (grades 1 to 5), basic secondary education (grades 6 to 9), vocational secondary education (grades 10 and 11) and tertiary or superior education (university level). Academically, Colombian eighth graders ranked 54th among the 65 nations participating in the 2009 PISA assessment. In science, Colombian students performed below the OECD indexes/ expectations for the region.

Germany has 16 different states, and in each state, there are up to five different curricula for different ability levels. Data for this research were collected in the state of Baden-Württemberg in the medium stratification, with pupils having a medium ability level. Germany has—in most federal states—a four-year grammar school for all pupils (in some states, 6 years), then separates the pupils according to their abilities into two to four levels (three in Baden-Württemberg), of which the pupils of the medium level participated in the present study. Based on the latest OECD school achievement report (OECD, 2010), in sciences, Germany is ranked statistically significantly above the OECD average. In science, teaching zoological topics such as "adaption of birds to their habitat" is specifically included at grade 5 or 6.

In Slovakia, the educational system consists of compulsory education for nine years. Similar curriculum is followed throughout the country. A recent educational reform (started in 2008) is based on a conceptual change from a systematic to an ecology approach (for curriculum details, see Prokop, Tuncer, & Chudá, 2007a), but during the implementation of the present research, it was found that Slovak pupils learn zoology at the grade 6 (age 11/12), following a traditional curriculum. In this age, it is expected that Slovak children are able to identify common native animals, and know their anatomy, morphology, and ecology.

In Turkey, the educational system consists of compulsory education for eight years. Throughout the country, a common curriculum is followed. Recent science education curriculum emphasizes that all students should develop scientific and technological literacy (Ministry of National Education [MoNE], 2005). Students learn biology topics in sixth and eighth grades. However, these topics are not directly related to zoology. They are associated with human biology. In PISA 2009 and 2012, Turkish students were ranked statistically below the OECD average. They ranked 43rd among the 65 countries in the 2009 PISA assessment exam.

Method

Participants and Data Collection

We collected data in Germany (3 schools, 157 students), Slovakia (7 schools, 213 students), Turkey (3 schools, 273 students), and Colombia (2 schools, 204 students). The participation was unpaid, voluntary, and anonymous. The study complies with the current laws in the respective countries. The mean age of participants was between 10 and 14 years (Mean = 11.48, SE = 0.69). Of the participants, 43.9% were males (n = 372), while 56.1% were females (n = 475).

Measurement Instruments

All measurements were based on previous research (see discussion below), and received a face validity through expert ratings from the authors and their colleagues from schools and universities (experts in biology education, ornithologists). Face validity in this case meant that previous versions of the questionnaire were circulated among science educators familiar with the topic and the items were adapted, discussed, and/or changed according to this process.

Interest

The scale was based on 17 items representing one factor (Cronbach's alpha .90; see Table 1 for details and items). The items were five point-Likert type. The items were modified according to Prokop, Kubiatko et al. (2008).

Attitude

The development of attitude items was inspired by the previous work of Prokop, Kubiatko et al. (2008). The items were five-point Likert scaled (Table 2) and two factors with an eigenvalue greater than 1 were extracted using a principal component analysis with Varimax rotation. We labeled the two scales

Table 1
Interest in the Biology of Birds

Items	Item-scale correlation
I like natural history films about birds	.569
I would like to go on an expedition focused on the protection of eagles	.514
Investigating biology of birds in the future would be interesting for me	.595
I am interested in why birds sing	.593
I consider the topic of bird migration very boring (item recoded)	.401
I would like to keep a bird with a nice voice	.474
It would be interesting to know why birds migrate	.522
I would like to learn why penguins live in cold climates and parakeets in the tropics	.535
I am interested in how bird parents are able to find so much food for their young	.692
I would like to know how plumage of some birds is so colorful	.576
I would like to see the development of the embryo inside the egg	.572
I would like to know why some birds live in woods, others in water, or why some are terrestrial	.661
I would like to know why some birds nest in tree holes and others in open nests	.659
I would like to know whether more colorful males of some birds are really more attractive to females	.569
I would like to know more about the evolutionary origin of birds	.587
I would actively protect birds	.622
I would help to raise money to financially support bird protection	.613

Note: Five-point-Likert scaled: I absolutely disagree to I absolutely agree

"Positive affection," which measured affection, and "Negative attitude toward predators/parasites." The items were five point-Likert type coded. Details can be found in Table 2.

Myths about Birds

This scale was based on the previous work of Prokop, Kubiatko et al. (2008) and consisted of four items with a Cronbachs alpha of 0.60 (Table 3).

Table 2
Exploratory Factor Analysis on Attitudes toward Bird

	Component	
	Positive attitude	Negative attitude
It is very nice to see how the bird male feeds his female while incubating eggs	**.617**	–.043
I consider it very interesting that the males of some birds feed the females during courtship	**.602**	.056
It is unfair that some birds, such as the Rhinoceros Auklet, have to wait until dusk to return to its nest to avoid being attacked by other birds such as eagles and gulls.	**.578**	.134
It is very brutal that small chicks are ejected from their own nests by parasitic cuckoo	**.529**	–.126
It is really interesting to see the cooperative work of the Grooved and Smoothed-Bill Anies. All group members share a single nest and care for the young that result from eggs from different females of the group.	**.527**	–.092
Crows often eat young birds. If I see a crow robbing a young bird, I would scare it away.	**.429**	.119
It is okay when crows and other species are mobbing predators to drive them away	**.427**	.133
I prefer the eating habits of birds that feed on carrion because they do not kill other species.	**.421**	.095
I would shoot hawks and eagles to protect small birds	.010	**.639**
Hawks are harmful because they kill smaller birds	.058	**.564**
Cuckoos/Brown-headed cowbirds should be shot because they destroy chicks of other passerine birds	.052	**.562**
I hate birds such as the Blue Jay since they cheat by imitating the Red-shouldered Hawk, which does it to scare its neighbors.	.157	**.509**
Birds of prey are unimportant for nature	–.136	**.457**
Cuckoos are very harmful for all songbirds	.326	**.367**

Animal-related Activities

Items for this dimension were based on Randler (2010), and we calculated a mean score and analyzed the activities separately (Table 4). The items were five point-Likert type coded. Reliability for these items was found as Cronbachs alpha of 0.81.

Table 3
Items for Myths about Birds

Owls hook near a house where someone will die
Hummingbirds ride on the backs of geese when they migrate
Woodpecker picks grubs from trees because it is a doctor of trees
Cock crows because it wants to wake up people

Likeness of Bird Species

The list contained 18 different species, from songbirds to raptors and farm birds (see Appendix). Pupils rated these species according to how much they are liked on a five-point Likert scale. We followed the approach of Tomažič (2011), who used such a classification for fear and disgust, but converted the questions to being about liking as birds usually rank low on disgust and fear scales (Tomažič, 2011). The Cronbach alpha was high (0.84). The items were five point-Likert type coded.

Statistical Procedures

We used SPSS 19 (IBM, Somers, NY) for statistical analyses. We performed correlations, analysis of variance (one-way-ANOVA), and general linear models with a type III sum of squares for unequal sample sizes (GLM). First, we included interactions in the GLM, but then, the nonsignificant interactions were deleted and the models were recalculated. The significance level was set at 5% two-tailed.

Results

Interest in birds differed significantly between the countries ($F_{3,842}$ = 25.198, p < 0.001, eta2 = 0.082) and between the genders ($F_{1,842}$ = 6.952, p = 0.009, eta2 = 0.008). The interaction was not significant and was removed from the model. The highest interest in birds was reported in Colombia, followed by Slovakia, Turkey, and Germany (Figure 1). Girls reported a greater interest than boys in all countries (Figure 1). Post-hoc comparisons were significant between Colombia and all of the other three countries (p < 0.05).

Attitudes were divided into two factors. FAC_1 was labeled "positive affection." There were differences between the countries ($F_{3,842}$ = 7.341, p < 0.001, eta2 = 0.025) and between the genders ($F_{1,842}$ = 3.827, p = 0.051, eta2 = 0.005). The highest score was obtained in Slovakia, followed by Colombia, Turkey, and Germany (means: Colombia [0.126], Germany [–0.175], Turkey [–0.160], Slovakia [0.180]). High scores represent high incidence of positive affection toward birds. Gender differences were only marginally significant, with girls scoring higher.

FAC_2 was labeled "Negative attitude toward predators/parasites" and was significantly different between the countries ($F_{3,842}$ = 49.357, p < 0.001, eta2 = 0.150), with no significant gender differences ($F_{1,842}$ = 0.347, p = 0.556). Negative attitude was highest in Slovakia, followed by Turkey, Germany, and Colombia (means: Colombia [0.682], Germany [–.106], Turkey [–0.190], Slovakia [–0.311]; note that negative values represent a higher negative attitude).

Myths were significantly different in the four countries ($F_{3,842}$ = 53.458, p < 0.001, eta2 = 0.161), with no gender effect ($F_{1,842}$ = 0.952, p = 0.329). Mean scores of myths about birds were [mean ± SE]: for Germany, 2.11 ± 0.063; for Turkey, 2.35 ± 0.048; for Colombia, 3.00 ± 0.055; and for Slovakia, 2.86 ± 0.054. Germany and Turkey differed significantly from the other two countries (post-hoc comparisons), Slovakia and Colombia differed from Germany and Turkey (Figure 2). Thus, Germany scored the lowest in a significant way as compared to Colombia, and Colombia, in turn, scored lower than Slovakia, while there was no difference between Slovakia and Colombia.

Animal-related activities differed between the countries (Figure 3) $F_{3,842}$ = 20.547, p < 0.001 eta2 = 0.069), with figures being the following: Germany (2.55 ± .062), Slovakia (2.78 ± .053), Colombia

Table 4
Correlation between Interest and Other Variables of the Bird Questionnaire

		Positive attitude	Negative attitude	Myths	Likeness	Animal-related activities
Interest	Pearson's r	.380***	.040 ns	.159***	.511***	.611***

Note: *** indicates p < 0.001, ns = not significant

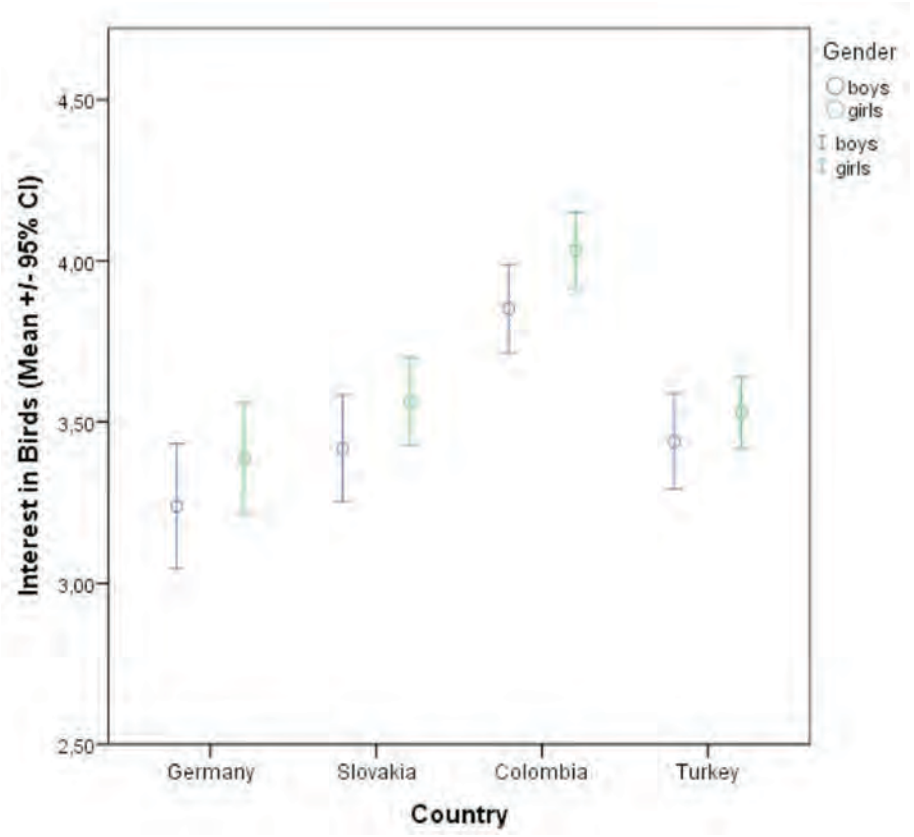

Figure 1: Interest according to country and gender.

(3.15 ± .05), and Turkey (2.71 ± .048). Significant post-hoc differences existed between all countries, except between Slovakia and Turkey (Figure 3).

Liking of birds did not differ in the four countries ($F_{3,842} = 0.759$, $p = 0.517$) and between genders ($F_{1,842} = 1.656$, $p = 0.199$). We found a bivariate correlation of interest with the positive affection scale (FAC_1; $r = .380$; $p \leq .001$), Myths (r = .159; $p \leq .001$), the "Liking of birds scale" ($r = .511$, $p \leq .001$), and "Animal-related activities" ($r = .611$; $p \leq .001$).

Discussion

The purpose of this study was to investigate the knowledge level for and attitudes toward birds among students from countries having varying levels of economic development. The most important finding of this study is that the interest in birds differed significantly between countries. In particular, Colombian students had the highest interest in birds as compared to Slovakian, Turkish, and German students. The ranking partly follows the economic development, which is the lowest in Colombia and which may foster the connectedness with nature and with living animals because in industrialized countries, there are many other different facets of life that may be relatively more interesting for young adolescents.

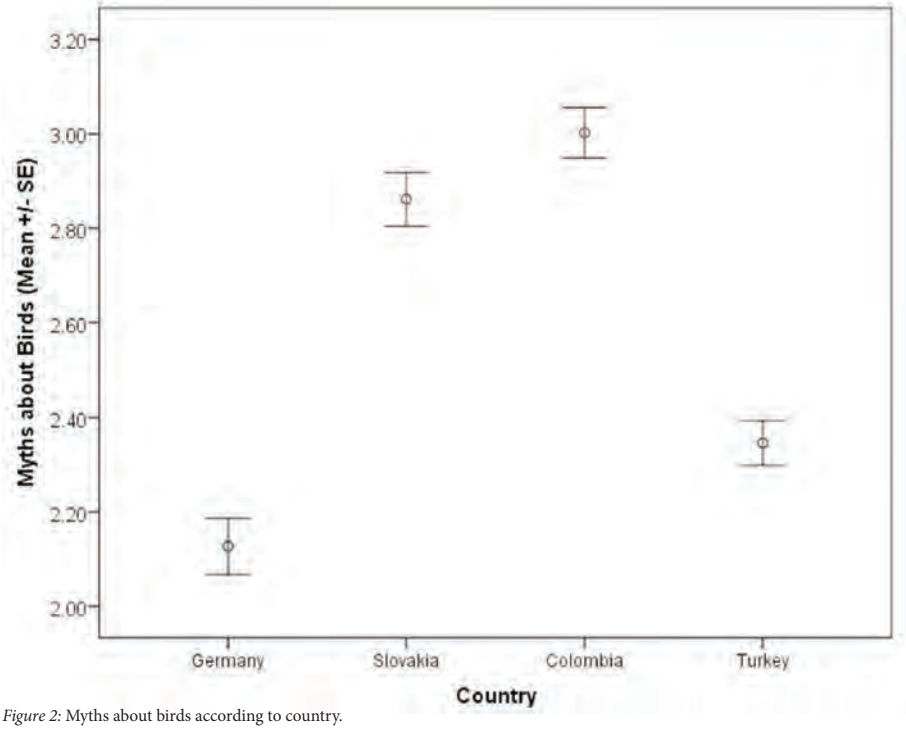

Figure 2: Myths about birds according to country.

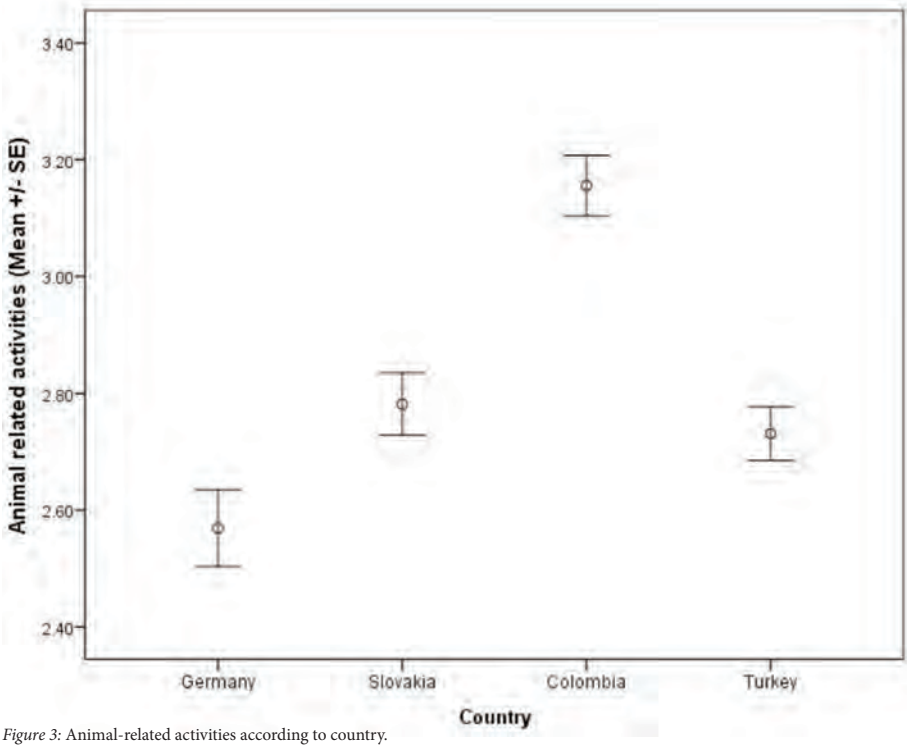

Figure 3: Animal-related activities according to country.

It may also depend on the different avifauna in the countries because Colombian species might be more attractive and their song might be more exciting as compared to European avifauna. Prokop and Fančovičová (2013), for example, found that attractiveness positively influences students' willingness to protect the species. It is likely that the link between an interest in birds and their attractiveness worked in this case, too. Perhaps the familiarity of the Colombian students with bird species can be attributed to their previous and current experiences with these particular species. Traditionally, the concept of extended families is a common feature in Colombian society. At home, children learn about nature not only from their parents but also from their grandparents, and in some cases, from aunts and uncles living in the same household. These adult family members serve as trainers in different aspects of daily life practices (e.g., fishing, working in the fields or in the city, running a family business). Likewise, having pets—which, in many cases, include caged birds—gives students a first-hand experience with these animals. Learning [about nature] in this communal manner presupposes that students use their home funds of knowledge to make sense of phenomena in nature (Molina, Torres, & Lopez, 2005). Castaño (1998) found that the perceptions of plants that Colombian children possessed differ from that of children of other nationalities. In their study, Molina et al. (2005) asked Colombian students (8–13 years old) with provincial and urban backgrounds to write a letter to an alien, describing their conceptions about nature and living things they know about. One of the major findings indicates that the provincial students' descriptions were more nature-rich than those of their urban counterparts.

Girls reported a greater interest in birds than boys in all countries. This result contradicts an earlier work (Prokop, Kubiatko et al., 2008), where we did not find any differences in the interest in birds between males and females. Similarly, Randler et al. (2012) reported no gender differences in the interest in zoology, but the sample was based on third and fourth graders, who are younger than our present study's sample population. However, our earlier work was conducted in a sample of older participants, which could account for this failure. One way to interpret gender differences may discuss the greater female concerns about environmental degradation. Females usually report a greater environmental concern and greater pro-environmental behavior than males (McMillan, Hoba, Clifford, & Brant, 1999; Shobeiri, Omidvar, & Prahallada, 2006; Prokop & Kubiatko, 2014; Zelezny, Chua, & Aldrich, 2000). Thus, they would express greater interest in animals, especially those that are endangered. The problem with this idea is that a recent study of Prokop and Fančovičová (2013) failed to show any gender differences in the willingness to protect animals. It should be noted that their research was conducted with older participants. Another possible explanation for gender differences in the interest in birds may be related to preferences for particular animals. While boys prefer less popular animals, such as bats or rats or predators, girls prefer more "cute" animals such as squirrels, rabbits, or small birds (Bjerke & Østdahl, 2004, Prokop & Kubiatko, 2008; Prokop & Tunnicliffe, 2010). It may be that round heads of "cute" animals with relatively large eyes would be more preferred by females as a result of their preference for baby schema (Lorenz, 1943).

Positive affection was different in the four countries. The highest scores were obtained in Slovakia, followed by Colombia, Turkey, and Germany. This is a surprising finding because Slovak children scored highest in their willingness to kill snakes (in would-be situations when they would meet a snake in nature) in an international comparison (Ballouard et al., 2013). However, birds are generally perceived more positively than snakes (Kaltenborn, Bjerke, Nyahongo, & Williams, 2006; Knight, 2008; Prokop & Fančovičová, 2013), so perhaps patterns obtained for snakes need not correspond with patterns obtained for birds.

Positive affection was different by gender, with girls showing higher affection. Such a finding was an expected result because girls and women generally express a more positive attitude toward nature (reviewed by Zelezny et al., 2000). Negative affection differed significantly by country, but no significant gender differences were found. Negative attitudes were the highest in Slovakia, followed by Turkey, Germany, and Colombia. This finding fits with the previous results obtained by Ballouard et al. (2013) (see above). It is interesting to note here that we found gender differences in positive attitudes, but not in negative attitudes. However, the p value of 0.051 was only marginally significant in the positive affection. Thus, we can consider this as there being no gender differences in affection.

There were significant differences in the myths domain between countries, especially in the cases of Colombia and Slovakia, where the myths about birds received the highest scores. Myths can be seen as "wrong" knowledge. Considering that myths

showed associations with negative attitudes toward animals in some works (Prokop, Fančovičová, & Kubiatko, 2009), greater attention should be given to children's beliefs and knowledge about animals.

Animal-related activities differed among the countries (Figure 3) with the highest scores in Colombia and the lowest in Germany, again reflecting—to some extent—the level of economic development. Participants who were more interested in birds reported more animal-related activities as compared to participants with a low interest in birds. Although it cannot be answered here whether interest promotes activities or vice versa, at least watching natural history films can be associated with an interest in bird conservation (Bjerke, Kaltenborn, & Ødegårdstuen, 2001) and walking in areas of nature can be associated with a decreased fear of predators (Prokop, Usak, & Erdogan, 2011; Røskaft, Bjerke, Kaltenborn, Linnell, & Andersen, 2003). This finding suggests that animal-related activities should be supported by both teachers and parents to increase children's positive behavior toward animals.

Limitations of the Study

The present study has some limitations. First of all, we assessed students' interests and attitudes toward birds by using a single method through the administration of the Bird Knowledge Questionnaire and the Bird Attitude Questionnaire. It is generally accepted that using other data collection tools, such as drawing and interviews, would allow students to reveal their interests and attitudes toward birds. However, using interview- and drawing-based methodologies would have resulted in limited sample sizes. Another limitation is that we did not investigate whether students lived in farms or not. In addition, we did not examine the impact of keeping birds or other animals in their house. For example, Prokop, Prokop, and Tunnicliffe (2008) reported that keeping animals at home significantly contributed to children's concepts of vertebrates and invertebrates. In their study, they found that children rearing two or more animals had better scores than children rearing only one or no animals. Even though the present study had limitations, as we mentioned above, we believe that collecting data using interviews may be useful in further studies in the field of science education.

Conclusion

The results suggest that German pupils can be characterized as having more knowledge, thus scoring relatively higher in the cognitive domain and scoring relatively lower in the interest and affection domain, while Colombians can be characterized by having a relatively greater interest in birds, stronger beliefs about bird myths and frequent animal-related activities. Gender effects could be characterized by girls showing a higher interest in birds as compared with boys. This result indirectly supports the idea that females may show greater pro-environmental concerns than males. There were no gender differences in the cognitive domain. Our data suggest that high factual knowledge about birds is not a necessary prerequisite of interest in birds. Instead, animal-related activities seem to be important determinants of positive attitudes toward birds. We suggest that there is a need to focus on the relationships among these variables.

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Appendix

List of Species used for the Likeness Questions

Hühner (cocks and hens)
Truthähne und Puten (turkeys)
heimische Enten (ducks)
Tauben in Städten (pigeons/doves)
Wachteln (quails)
Krähen (crows)
Adler (eagles)
Finken (finches)
Hausspatzen (house sparrows)
Reiher (herons/egrets)
Stare (starlings)
der Blaue Ara (blue ara)
Kanarienvögel (canaries)
Strauße (ostrichs)
Pinguine (penguins)
Kolibris (hummingbirds),
Tukane (tukanes)
Geier (vultures)