

## Elementary School Pupils' Knowledge and Misconceptions about Birds

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### Abstract

*Problem Statement:* Birds are an inseparable part of nature, with an important function. Pupils' knowledge is influenced by their own experiences, but mostly by the school environment. From this it is evident that schools can play an important role in forming pupils' environmental attitudes and can encourage them to join in conservationist activities.

*Purpose of Study:* This study focused on investigating students' knowledge and misconceptions about birds. The main goal was to find out elementary school pupils' perceptions of birds.

*Methods:* Pupils' knowledge and misconceptions were evaluated using a self-constructed knowledge test consisting of 30 questions, twelve of which were open-ended while the rest were multiple choice. Questionnaires were prepared with respect to Slovakian elementary science schools' curriculum concerning birds. The participating students, 719 in total, attended seven Slovakian elementary schools. Their ages ranged from ten to sixteen. Statistical procedures were based on the comparison of results between boys and girls, between respondents from villages and from towns, between pet-owners and non-pet owners and among pupils of classes from Slovakian elementary schools grades 5 to 9.

*Findings and Results:* The overall results showed that Slovakian elementary school pupils had serious problems with birds. Wrong ideas occur in all dimensions, and pupils of all age groups gave incorrect answers. Questions were distributed in five dimensions: 1. Identification of birds, 2.

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Reproduction of birds, 3. Food of birds, 4. Bird's senses, and 5. Bird migration. Girls achieved statistically significant higher scores than boys. Pupils who went through the curriculum about birds in elementary school were more successful than pupils who did not. The effects of residence (in towns or in villages) and pets were not significant.

*Conclusions and Recommendations:* Data confirm the view that children do not come to primary science lessons as a 'tabula rasa' but come with rich knowledge about their physical world based on their everyday experiences. Recommendations suggested in the conclusion chapter of the paper focus on the implications for education.

*Keywords:* birds; elementary school pupils; knowledge test; misconceptions

Birds are an inseparable part of nature with important functions: they consume insects and other pests, and they play a role in the pollination of plants and trees (Jones & Sieving, 2006). In many countries birds are food for people (Meiklejohn, 1962). Also, they are an unsubstitutable part of the food chain. Many people have no idea about the function and importance of birds. However, before increasing positive environmental attitudes, it is important to find out about pupils' knowledge of birds.

Pupils' knowledge is influenced by their own experiences and by the school environment, which is influenced to a great extent by pupils' perception of birds as unique organisms. From this fact it is evident that schools can play an important role in forming pupils' environmental feelings and conservationist activities (Erdogan & Usak, 2009; Prokop, Tuncer & Chudá, 2007). To a minor extent, pupils' knowledge is influenced by parents, friends, magazines, media (TV, Internet), and books (Erdogan, Coskun & Usak, 2011).

The present research is mainly oriented toward investigating pupils' misunderstandings about different phenomena. These misunderstandings have different names such as wrong ideas, alternative conceptions, preconceptions or misconceptions. In this text we use the terms preconception or misconceptions (Kose, Usak, & Bahar, 2009; Prokop, Usak, Ozel, & Fancovicova, 2009).

Misconceptions are created through misunderstanding or wrong understanding of curriculum content. Misconceptions occur when a pupil is creating a symbiosis with new curriculum content. Part of the knowledge from new curriculum is understood correctly, creating new knowledge; part is connected to previous preconceptions; and part of the pupil's knowledge remains unchanged. This last part impedes future learning. Misconceptions can also be created from one's own experience, incorrect articulation or from mistakes in a text. Through teaching or learning, pupils can receive a parallel understanding of phenomena or ideas – that is, one understanding is for school and one is for everyday life (Gilbert, Osborne & Fensham, 1982). Lazarowitz and Lieb (2006) stipulate that meaningful learning occurs when a new concept is integrated with relevant ideas and concepts that have previously been learned. Students have to integrate new ideas or new concepts into their existing cognitive structure. Without this integration, rote learning takes place, the memory will be short lasting and transfer skills will not be mastered.

Misconceptions have some important characteristics: they are found in males and females of all ages, abilities, social classes and cultures; they are often resistant to conventional teaching approaches; they interact with knowledge presented by teachers; they resemble the ideas of previous generations of natural philosophers; they serve a useful function in the everyday lives of people; they are the product of direct observation, everyday language, the mass media and peer culture and they are found frequently among teachers as well as students (Mintzes, 2003).

When we investigate pupils' misconceptions about animals, we find that the majority of research is concerned with examining pupils/students wrong ideas about the classification of organisms. For example, Chen and Ku (1998) examined children's conceptions of animals and animal classification. As a research method they used a clinical interview and a classification task involving the sorting of pictures of animals into major classes. The results indicated four forms of classification thinking: (a) living, (b) nonliving, (c) animal with scientifically acceptable attributes and (d) animal with scientifically unacceptable attributes.

Yen, Yao and Chiu (2004) examined students' alternative conceptions of reptiles and amphibians. Most students were able to classify snakes as reptiles. More students were able to correctly classify frogs as amphibians than toads. Students classified sea turtles as amphibians largely because sea turtles are able to live in both terrestrial and aquatic habitats.

Braund (1991) found that the highest level of response of 'vertebrate' occurs for animals with a well-defined head and limbs or having a body that is rigid. This feature of rigidity is more often referred to by younger pupils. Children often referred to hard bodies or shell-like coverings in justifying their use of the term 'vertebrate'. Conversely, their justification for classifying snakes and eels as invertebrates often refers to their bodies being able to bend. Braund's (1991) study found significant difference in gender, with girls achieving better scores than boys.

Barrow (2002) tried to determine students' understanding about insect characteristics, life cycles, environmental conditions, and their impacts on humans. Students had greater personal knowledge about the harmful than about the helpful aspects of insects and humans. Kattmann (2001) found that students prefer to classify animals using the criteria of habitat and locomotion. Students continue using these criteria even after learning the categories of biological taxonomy.

Above are presented a few papers that focused on the investigation of pupil/student misconceptions. Next, papers focused on pupil/student knowledge/misconceptions about birds are presented. Prokop and Rodák (2009) investigated whether pupils could identify 25 bird species by following their songs, growth habits, or both features presented simultaneously. Less than 20 % of the presented birds were successfully identified by song, about 39 % by growth habits and nearly half of the pupils identified birds correctly when they heard their song and saw their growth habit simultaneously.

Randler (2008) examined students' knowledge about vertebrates, including some bird species. He found differences in gender, where girls were more successful than boys, and also in grades, where older pupils were more successful than younger.

Jacobson, Sieving, Jones and Van Doorn (2003) examined farmers' knowledge about birds and found that only 1/3 were able to report more than 30 birds on or around their farms. Randler et al. (2007) found an increase in knowledge about animals with increased age of respondents, but in their research there was no significant difference in results between genders.

Prokop, Kubiato and Fančovičová (2007) showed that 7-15-year-old pupils' knowledge about birds is inconsistent and that a substantial number of children have various misunderstandings about bird biology and systems. For example, a majority (75 %) of pupils thought that a penguin's body is covered with hair or just skin. About 40 % of all pupils incorrectly classified a penguin as a non-bird species (see also Kellert, 1985; Trowbridge & Mintzes, 1985), and nearly all (89 %) thought that cocks crowed to wake up people or hens (Prokop, Kubiato & Fančovičová, 2007). Other studies provide less direct evidence of human attitudes toward, and knowledge of, birds (Braun, Buyer & Randler, 2010; Cardak, 2009; Prokop, Kubiato & Fančovičová, 2008; Randler, 2009). Kellert (1985), for example, showed some children's misunderstanding of bird biology and bird classification.

Some studies focused on the influence of pet ownership on the knowledge of children. Owning pets has also been shown to result in more knowledge of animals in general (Inagaki 1990; Prokop, Prokop & Tunnicliffe, 2008).

### **Current Study**

The present study focused on investigating pupils' knowledge and misconceptions about birds. The age of selected participants was between 10 and 16 years. This age was chosen because, in the United States, Kellert (1985) found that this age was important in the development of children's cognitive abilities. The main aim was to find out elementary school pupils' wrong ideas about birds.

This paper explores the following research questions:

1. *Are there any gender differences in knowledge about birds?*
2. *How does knowledge change with the age of pupils?*
3. *Are there any differences in knowledge about birds with respect to residence of pupils?*
4. *Are there any differences in knowledge about birds in respect to pet and non-pet owners?*

On the basis of the research questions we wanted to verify the validity of the following hypotheses:

1. *Girls will achieve a higher score in knowledge tests about birds in comparison with boys.*
2. *Pupils who go through a curriculum about birds will achieve higher scores in comparison with pupils who do not go through a curriculum about birds.*
3. *Pupils from villages will be more successful on the knowledge test about birds in comparison with pupils from towns.*
4. *Pet owners will achieve higher scores in comparison with non-pet owners.*

## Methods

*Construction of questionnaire.* Students' knowledge and misconceptions about birds were measured by a knowledge test constructed by the researchers. The knowledge test consisted of 30 items, 12 of which were open-ended, and 18 multiple choice questions. The multiple choice questions had between 3 and 5 proposed answers, with only one correct choice. One of the multiple choice questions included a graphic in which pupils had to choose an animal representing a bird. Pictures were used to examine students' abilities to recognize birds from among animals having features akin to birds. Using one word or short answers, students were asked to respond to open-ended questions in the test. To ensure test clarity, questions were reviewed by elementary school teachers who made some corrections to the wording of the questions.

Questions in the test about birds were written based on the Slovakian elementary school curriculum. Birds are included in the curriculum of the 6<sup>th</sup> year of study. The test authors also utilized research studies by Kubiátko and Prokop (2007) and Prokop, Kubiátko and Fančovičová (2007) in writing test items. Questions included examples from everyday life, and children might have direct or indirect experience with the examples. Some questions were on exotic birds because students should be familiar not only with native birds but also with common exotic birds as general knowledge.

To ensure test validity, two zoology experts reviewed the test items. They investigated whether the questions were relevant to the aim of the study. Test items were revised based on their comments and suggestions.

The questions were grouped into five categories: (1) Identification of birds (10 questions), (2) Reproduction of birds (7 questions), (3) Food of birds (5 questions), (4) Bird senses (4 questions) and (5) Bird migration (4 questions). The knowledge test also included demographic questions about students' gender, age, and grade, where they lived and whether they owned a pet. The original test instrument is presented in Appendix A.

*Participants.* Participants of the study consisted of 719 students (338 boys and 381 girls) attending seven Slovakian elementary schools. Distribution of students by grade was as follows: 88 5<sup>th</sup> graders (10/11 years), 195 6<sup>th</sup> graders (11/12 years), 172 7<sup>th</sup> graders (12/13 years), 130 8<sup>th</sup> graders (13/14 years) and 134 9<sup>th</sup> graders (between 14 and 16 years). The age of students was between 10 and 16 ( $x = 12.72$ ;  $SD = 1.39$ ). A total of 448 students were living in villages and 271 students were living in towns. Only 549 of the students were pet owners.

*Procedure.* The knowledge test was anonymously administered in seven Slovakian elementary schools. Students were told that the test was not an exam, but was administered for research purposes and that they would not be graded. After providing instruction on the test procedure, teachers administered the tests in classrooms. There was no time limitation but all of the students appropriately completed and returned the tests within 30 minutes.

*Statistical analyses.* Using different statistical procedures, students' test results were compared according to different variables. To calculate students' total test

scores, no points were assigned to incorrect answers and 1 point was assigned to correct answers. From the points, a mean score was calculated.

The data were normally distributed, as was found by using the Shapiro-Wilks test ( $W = 0.98$ ;  $p = 0.10$ ), so parametric methods were used. Analysis of covariance (ANCOVA) and multivariate analysis of covariance (MANCOVA) were employed to investigate whether there were significant differences in students' test scores by gender, by where students lived (village or town), by pet ownership or by grade. Age was used as a covariate because this might influence participants' knowledge about birds. The mean score from the test was used as a dependent variable. When a dimension was evaluated, the mean score from only the questions belonging to the dimension were taken into consideration. The demographic variables (gender, residence, pet ownership and grade) were considered independent variables. The correlation among groups was measured using a Pearson product moment. Mean scores of each dimension were correlated. The reliability of the knowledge test was determined using Cronbach's alpha ( $\alpha = 0.55$ ). The value of  $\alpha$  is satisfactory according to Dhindsa and Chung (2003), who showed a similar minimal value of reliability ( $\alpha = 0.59$ ).

## Results

*Overall score.* The overall mean score on the knowledge test about birds was 18.28 ( $n = 719$ ;  $SD = 4.30$ ;  $min = 6$ ;  $max = 30$ ). Differences in results were measured. ANCOVA was used, where the test score was used as a dependent variable, demographic variables were categorical predictors and age was defined as a covariate. Table 1 shows no effect of age on the results. A statistically significant difference was found in the results by gender, where girls achieved higher scores ( $x = 15.29$ ) than boys ( $x = 14.24$ ). There was also a statistically significant difference among grades, where the most successful pupils were in the 8th grade ( $x = 15.16$ ) with the lowest score achieved by 6th grade pupils ( $x = 14.23$ ) (Figure 1).

It is possible to divide the pupils in the study into two groups: pupils who went through curriculum about birds and those who did not. We found an influence of age on these results ( $F(1, 716) = 4.18$ ;  $p < 0.05$ ), and a significant difference between the two groups of pupils ( $F(1, 716) = 15.92$ ;  $p < 0.001$ ). Pupils who went through the curriculum about birds achieved higher scores ( $x = 15.16$ ) than pupils who did not ( $x = 14.23$ ).

Next, a statistically significant difference was found between some of the categorical predictions (Table 1). Interaction between grade and gender showed that females were better in all grades except 8, with the highest differences in 6<sup>th</sup> and 7<sup>th</sup> grade. Pupils from town were better in all grades, with the highest differences between students in the 5<sup>th</sup> and 8<sup>th</sup> grades. Interactions among more than two variables were inconsistent.

Table 1

*Values of ANCOVA for Variables*

Variables	df	F
Age	1	2.01
Gender	1	<b>4.24*</b>
Residence	1	2.54
Grade	4	<b>3.67**</b>
Pet	1	0.89
Gender x residence	1	1.18
Gender x grade	4	<b>2.54*</b>
Residence x grade	4	<b>2.66*</b>
Gender x pet	1	0.16
Residence x pet	1	0.11
Grade x pet	4	1.78
Gender x residence x grade	4	<b>3.54**</b>
Gender x residence x pet	1	0.94
Gender x grade x pet	4	1.75
Residence x grade x pet	4	1.38
Gender x residence x grade x pet	4	<b>4.02**</b>

\* p &lt; 0.05; \*\*p &lt; 0.01

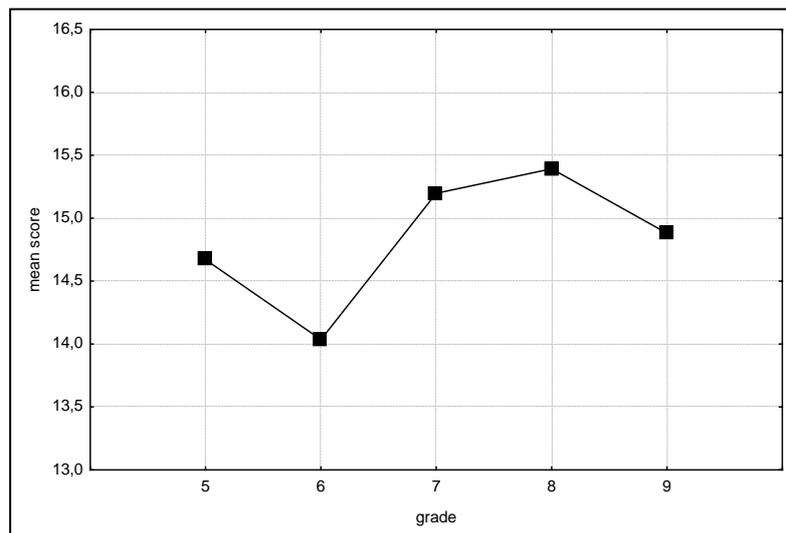


Figure 1. Mean score of pupils from different grades.

*Dimensions.* Relation among dimensions was low (0.1 – 0.3) or trivial (under 0.1) (Table 2). This means that dimensions influence each other at very low levels (Cohen, 1980).

Table 2  
*Relation among Dimensions*

	<b>Reproduction of birds</b>	<b>Food of birds</b>	<b>Bird senses</b>	<b>Bird migration</b>
<b>Identification of birds</b>	0.27	0.09	0.15	0.30
<b>Reproduction of birds</b>		0.11	0.09	0.22
<b>Food of birds</b>			0.04	0.14
<b>Bird senses</b>				0.12

\*Values under 0.1 – trivial correlation, values from 0.1 – 0.3 – low correlation

Table 3 shows that pupils had the biggest problem with questions belonging to the dimensions “Food of birds” and “Bird senses”. Pupils were the most successful with the question belonging to the dimension “Reproduction of birds”.

Table 3  
*Descriptive Statistics of Dimensions*

	<b>Number of questions</b>	<b>Mean score</b>	<b>%</b>	<b>SD</b>
<b>Identification of birds</b>	10	5.87	58.70	1.62
<b>Reproduction of birds</b>	7	4.28	61.14	1.36
<b>Food of birds</b>	5	1.09	21.80	0.94
<b>Bird senses</b>	4	1.34	33.50	0.70
<b>Bird migration</b>	4	2.23	55.75	0.99

Table 4 shows the results of MANCOVA. There was no effect of age on the results. Girls achieved a statistically significant better score in the dimension “Reproduction of birds”. In the dimensions “Food of birds” and “Bird senses” boys were more successful than girls. Pupils from town achieved statistically significant better scores in the first dimension, but pupils from villages were more successful in the dimensions “Food of birds” and “Bird migration”. The effect of grade level is shown in Figure 2. The effect of pet ownership was found only in interactions with other categorical predictors.

Table 4  
Values of MANCOVA for Variables

Variables	Identification of birds	Reproduction of birds	Food of birds	Bird senses	Bird migration
Age	2.87	0.11	0.42	2.26	0.97
Gender	1.55	<b>14.09***</b>	0.11	0.13	0.10
Residence	<b>5.12*</b>	0.98	0.04	1.65	0.25
Grade	<b>4.97***</b>	<b>4.61**</b>	<b>3.89**</b>	1.78	1.71
Pet	2.42	0.05	0.03	0.87	0.00
Gender*residence	0.80	0.49	0.28	0.60	0.01
Gender*grade	<b>2.58*</b>	1.60	0.70	0.71	0.97
Residence*grade	2.20	<b>2.94*</b>	1.03	1.61	2.35
Gender*pet	0.32	0.03	0.21	0.79	0.17
Residence*pet	0.00	0.32	0.06	0.23	1.38
Grade*pet	0.44	1.29	1.23	0.57	<b>4.32**</b>
Gender*residence*grade	1.14	<b>3.56**</b>	1.96	0.81	1.97
Gender*residence*pet	0.58	0.17	1.91	0.06	0.07
Gender*grade*pet	0.72	<b>3.30*</b>	1.63	0.51	0.69
Residence*grade*pet	0.66	<b>2.89*</b>	0.45	0.35	0.89
Gender*residence*grade*pet	0.92	<b>3.75**</b>	1.04	0.82	<b>2.44*</b>

\* p < 0.05; \*\*p < 0.01; \*\*\* p < 0.001

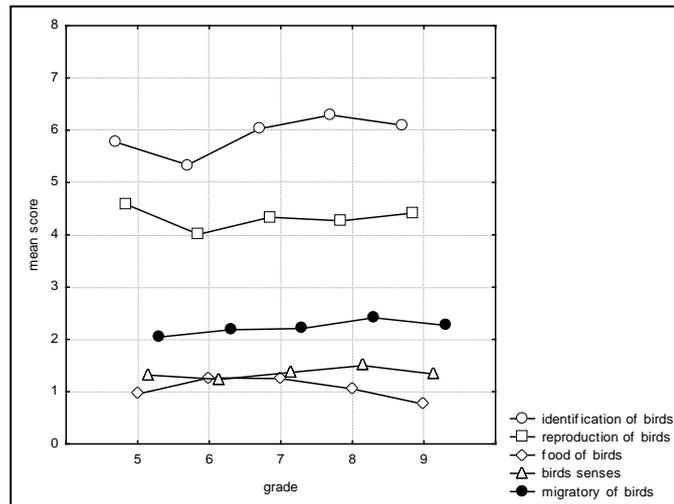


Figure 2. Mean score of dimensions.

*Selected misconceptions.* In the dimension "Identification of birds" pupils had the most problems with the question, "What is a penguin's body covered with?" Only 1/5 of the pupils answered correctly (feathers). The most frequent wrong answer was naked skin (47.43 %). Nearly 1/3 of pupils marked a coat as an overlay of the penguin's body. Pupils from 5th grade were the most successful (more than 30 %) while pupils from 9th grade achieved the worst score (approximately 10 %). Another problematic question was, "What is done with birds' feathers during their life?" Only 2/5 of pupils answered correctly (a bird changes his feathers every year). One third of pupils thought that feathers grow gradually while the rest of the pupils thought feathers ended their growth in the first year of a bird's life.

In the dimension "Reproduction of birds" the most problematic question was, "What does it mean: "The bird is altricial"?" Approximately 1/4 of pupils answered correctly (parents feed the young). The results were inconsistent with respect to grade. Pupils from the 6th and 8th grades achieved the worst score (about 20 %) while other grades achieved a higher score (about 35 %). This question was open-ended, so there was a scale of wrong answers. The wrong answer given most often was "humans have to feed the bird"; approximately 40 % of the pupils answered this way. The next most frequently given wrong answers were, "the bird lives without help of parents", "the bird eats a lot of food" or "the bird eat food only from a bird table".

In the dimension "Food of birds" many questions were problematic for pupils. We present two, where the most interesting results were found. Only 12.38 % knew any birds that make supplies of food for winter, such as the jay or the nuthatch. Nearly half of the pupils did not know any birds that do this. Some pupils wrote, for example, sparrow, swallow or blackbird, and some pupils wrote bear or squirrel, which are not birds. Pupils from the 6th grade achieved the highest score (about 18 %) and the youngest pupils achieved the lowest score (about 4 %).

Only 15 % of the pupils gave correct answers on the question, "What is the common food of wild ducks?" (plants). More than 40 % of the pupils wrote fish as a source of food for ducks. Other answers included water animals, ducks are omnivores, bakery products. Pupils from 7th grade were the most successful (about 20 %) and pupils from 9th grade achieved the lowest score (about 5 %).

In the dimension "Bird senses" the most problematic question was, "When does the owl see well?" Only approximately 3 % of the pupils answered correctly (the owl sees well during night and daylight equally). Almost all pupils answered that owls see well only at night. All pupils from the 5th grade marked this wrong possibility. Pupils from 8th and 9th grade achieved similar scores (about 7 % answered correctly). The next most problematic question in this dimension was, "Does the sparrow female leave the eggs when a human touches it?" Nearly 20 % of the pupils answered correctly. Pupils from 5th grade were the most successful; 1/3 of them answered correctly. Pupils from other grades achieved similar scores; approximately 15 % of them answered correctly. The rest of the pupils thought that the sparrow female leaves her eggs after a human touch.

In the last dimension, "Bird migration", pupils had problems explaining how it is possible that some birds migrate and some stay during winter in our country. Only 12.66 % of pupils answered correctly (the main reason is food). Birds have no source of food in Slovakia in the winter. Pupils from 6th grade were the most successful on

this question (approximately 18 %) while pupils from 9th grade achieved the lowest score (less than 10 % answered correctly). The most prevalent misconceptions were that birds freeze or are thermophiles or are migratory or they get used to winter.

### Discussion and Conclusion

This study examined Slovakian elementary school students' knowledge and their most common misconceptions about birds. There were four hypotheses. The first hypothesis is confirmed because girls had statistically significant higher scores on the test than boys did. Randler (2008) found similar results in his study. However, other studies did not confirm this finding. For example, Lazarowitz (1981) found no gender differences in younger pupils, while older boys scored better than girls. Ryman (1974, 1977) reported higher test scores for boys. One possible explanation of these results may be that girls concentrate more on curriculum than boys, and the test items measured cognitive skills (i.e., memorization), thus girls achieved statistically significant higher scores. Boys were more successful, but not significantly, in the questions related to bird food and bird senses, where previous interaction with curriculum plays an important role. Although research does not confirm this, the interest of students may play an important role in their acquirement of knowledge. While some findings have shown that girls are more interested in biology (Gardner 1975; Taber 1991) results of other studies do not confirm this finding (Dawson 2000). Randler (2008) indicates that "nowadays girls generally perform better even in subjects that were considered to be a domain of boys."

The second hypothesis is also confirmed because students who went through the elementary school curriculum about birds were more successful on the test than students who did not. It was found that 6th graders received the lowest score while the second lowest score belonged to 5<sup>th</sup> graders. These two groups did not study the curriculum about birds.

The most successful groups were the 8<sup>th</sup> and 9<sup>th</sup> graders, but their scores were close to the 5<sup>th</sup> graders' scores. One explanation for this could be that older students might have forgotten some of the information they learned when younger. This is not surprising, considering that semantic memory is suppressed by the increasing number of competing concepts that students acquire over time (Johnson & Anderson, 2004). Similarly, inconsistent results are found in different studies (Braund, 1991, 1998; Kattmann, 2001; Randler, 2008). On some questions, 5<sup>th</sup> grade students received the highest scores. This may be because younger students answered the questions without complicated thinking. Older students might not answer immediately, might think more and consider facts from different subjects. This might confuse them. Therefore, they might give an incorrect answer.

Because no significant effect was found on students' scores based on where they live and pet ownership, the next two hypotheses were rejected.

Overall, it was found that Slovakian elementary school pupils had serious misconceptions and a lack of knowledge about birds. There may be several reasons for this. First, it might be that, compared to zoology, teachers are more interested in 'modern' biology topics like microbiology, genetics or virology. Another important issue that emerged from the pupils' responses was culturally transferred myths about some animals. Many of these misconceptions are created in preschool, often

from pictures in books, or from tales read by parents to their children. For instance, there are tales in which it is advised not to touch a bird egg because female birds have a very strong olfactory sense, which is not true. Children are influenced too much by such incorrect information.

The most common misconception Slovakian elementary school pupils shared was about the owl's sense of vision. Very few students gave correct answers to the question about whether owls see equally well during night and day. This result was also observed in our previous research (Prokop, Kubiato & Fančovičová, 2007). The next most problematic question was about penguin feathers. Only 20% answered this question correctly. Pupils from different countries have problems classifying penguins. For example, Prokop, Kubiato and Fančovičová (2007) showed that only 25 % of pupils know that the penguin's body is covered by feathers and only 40% know that penguins lay eggs. Trowbridge and Mintzes (1985) showed that approximately 55% of pupils consider penguins to be mammals.

Tunncliffe and Reiss (1999) found that the home environment is the most important source of information about animals for elementary age children. Children have their own unique interpretation of the world and of physical phenomena, and hold various representations of the world. Mostly, students learn information about animals informally in out-of-school or free-choice learning activities such as visiting zoos, museums, parks and aquariums (Falk, 2005).

Solomon (1987) points out that a great amount of information is learned from the media, usually television, in an incidental, unintentional, casual fashion. Watching TV programs about animals and nature received almost a similar proportion of time compared to learning about animals in school (Bjerke, Kaltenborn & Ødegardstuen, 2001).

The current study provides information about how Slovakian elementary school pupils in various age groups see birds. Based on the analyses, the following suggestions are given to teachers:

1. Use more pictures in the teaching process, since textbooks are predominately text-based. The children's answers showed uncertainty in determining the animals that belonged among birds.

2. The experimental part of the teaching process is very important. Children should be in nature as often as possible. The teaching process in all conventional schools in Slovakia is situated in the classroom. Very few activities take place outside of schools, which is typical for both village and town schools.

3. More attention should be given to pupils' abilities to identify birds. This point is connected to the second point. Children will identify birds better when they spend time outside, where they may hear birdcalls. A similar suggestion is given in the study by Prokop and Rodák (2009).

4. Identify and discuss common misconceptions in the class. Keogh and Naylor (1999) and Jewell (2002) suggested that using concept cartoons, which appeal to and capture the interest of children, can help make children more aware of their own ideas and the changes in their ideas.

5. Teach more about exotic birds. Children have wrong ideas about birds that do not live in Slovakia (e.g., penguins). Children have problems identifying birds that

are exotic and which have features not typical for birds. Children consider them to be mammals or some other group of animals.

6. Teachers need to be aware that pupils are influenced by information from other sources such as parents, friends, and books. The influence of sources outside of the school may negatively affect the students' learning processes. In schools, students may already have misconceptions about birds, and teachers have to be prepared to tackle this. Children think, for example, that the woodpecker is a doctor of trees (this information is presented in many books for children) or that female birds abandon their eggs after a human touch because the female has a very well developed sense of smell (this kind of information is presented mainly by grandparents and parents).

7. Teachers should focus on all aspects of bird biology. The results of this study showed that some aspects of bird life are problematic for pupils (food of birds) and some are not (reproduction of birds). For example, have an activity such as constructing a bird feeder; then (mainly during the winter) children could observe the birds that gather on the feeder and determine which types of birds eat seeds. This activity could be connected with the determination of migrating birds.

8. Another activity that connects the food and reproduction of birds is an observation of birds when they feed their young in the nest. Children could see if adult birds feed their young using seeds or insects. Also, children could observe whether the birds build their nests in cavities or trees, for example.

In conclusion, this study gives new information on the investigation of misconceptions about birds. This study's findings can help teachers develop a better teaching process about bird life.

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**Appendix A: The measurement tool focused on the pupils' knowledge about birds.**

*Demographic variables*

**Gender:** male  female  **Residence:** village  city  **The year of study:** Age:...

Which pets do you keep at home? .....

*Knowledge part*

1. How is it possible, that some birds migrate and some stay during winter in our country?
2. Which of these birds belongs to migratory birds?
  - a) tit    b) crow    c) skylark    d) woodpecker
3. How are the ducks adapted to for swimming?
4. Which of these birds lay eggs into nests of the other birds?
  - a) owls    b) storks    c) cuckoos    d) eagles
5. Why does the woodpecker peck to the tree?
6. What is the number of fingers on the hens' leg?
7. What is done with birds' feathers during their life?
  - a) They are growing gradually
  - b) They end the growth in the first year of birds' life and then there is nothing to do with this
  - c) a bird is changing his feathers every year
8. What does it mean: "The bird is altricial"?
9. Why are the males of birds more colorful than females?
10. Do the tits eat something else than bacon or seeds at the birds' feeder (if yes, what)?
11. The smallest one of the birds' species in the world is:
  - a) hummingbird    b) wren    c) firecrest    d) finch
12. Which of these birds can move head downwards on trees?
  - a) wryneck    b) rainbird    c) woodpecker    d) nuthatch
13. Which of these birds can't fly?
  - a) ostrich    b) pheasant    c) cuckoo    d) stork
14. When does the owl see well?
  - a) during night    b) during daylight    c) during night and daylight equally
  - d) only in the morning
15. Who is feeding the younglings from the cuckoos' pair?
  - a) male    b) female    c) male and female    d) nothing a single one
16. What is the common food of wild ducks?

17. Who is feeding younglings from the ducks' pair?  
a) male b) female c) male and female d) nothing a single one
18. Is a woodgrouse truly deaf?
19. Are magpies staying in our country during winter?
20. What is a penguins body covered with?  
a) coat/fleece b) feather c) naked skin d) wool e) scales
21. Do you know some birds, which make supplies of food in winter?
22. Which one of these species isn't a bird?  
a) sparrow b) eagle c) bat d) woodpecker
23. Does the sparrow female leave the eggs, when human touch it?
24. Who is feeding younglings of tits?  
a) both parents b) female c) males d) not a single one
25. Which one of these birds makes a nest in an artificial hollow?  
a) skylark b) tit c) bunting d) finch
26. Where could you see an ostrich?  
a) America b) Africac) Asia d) Australia
27. Which one of these birds is feeding younglings after pecking out?  
a) pheasant b) partridge c) quail d) stork
28. Which one of these birds could you see during winter in our country?  
a) swallow b) skylark c) tit d) starling
29. Why shouldn't we feed birds just by bread during winter?
30. Which of these animals is bird? (circle)

a)



b)



c)



d)



e)



## İlköğretim Öğretim Öğrencilerinin Kuşlar Konusundaki Bilgileri ve Kavram Yanılgıları (Özet)

*Problem Durumu:* Kuşlar doğanın ayrılmaz ve en önemli üyelerinden birisidir. Ayrıca kuşlar doğada önemli fonksiyonları ve görevleri bulunmaktadır. Okullar öğrencilerin çevre koruma etkinliklerine katılma konusundaki motivasyonlarında çok önemli rol oynamaktadır. Bunun yanında, çocukların bilgileri, ailesi, arkadaşları, kitaplar, gazeteler ve medya tarafından da ciddi şekilde etkilenmektedir. Buradan yola çıkarak öğrencilerin doğada önemli görevleri yerine getiren ve doğanın ayrılmaz bir parçası olan kuşlarla ilgili bilgilerinin de kendi deneyimlerinden ve okul ortamlarındaki öğrenmelerden etkilendiği söylenebilir.

Öğrencilerin kuşları tanınması ve kuşlar konusundaki kavram yanılgılarıyla ilgili çok az çalışma bulunmaktadır. Bu çalışmada ilköğretim öğrencilerinin kuşlar hakkındaki bilgi düzeyleri, kavram yanılgıları sunulmuştur.

*Araştırmanın Amacı:* Bu çalışmada, öğrencilerin kuşlar ile ilgili bilgileri ve kuşlar konusundaki kavram yanılgılarının neler olduğuna odaklanılmıştır. Araştırmanın temel amacı, ilköğretim öğrencilerinin kuşlar konusundaki algılarını ortaya çıkarmaktır.

*Araştırmanın Yöntemi:* Öğrencilerinin kuşlar ile ilgili bilgileri ve bu konuda kavram yanılgıları yapılandırılmış bilgi testi ile değerlendirilmiştir. Slovak İlköğretim Fen Öğretim Programındaki kuşlar konusu dikkate alınarak hazırlanan bilgi testi, yirmi ikisi açık uçlu, sekizi çoktan seçmeli olmak üzere toplam otuz sorudan oluşmaktadır. Test; kuşların tanınması, kuşlarda üreme, kuşların beslenmesi, kuşların duyuları ve kuşların göçleri olmak üzere toplam beş alt boyutta hazırlanmıştır.

Çalışmaya Slovakya'daki yedi farklı okuldan toplam 719 ilköğretim öğrencisi katılmıştır. Katılımcılar on (10) ile on altı (16) yaş aralığındadır. Elde edilen veriler; cinsiyet, yaşam alanları (kırsal - şehir merkezi), sınıf düzeyi, hayvan sahibi olup olmama değişkenlerine göre analiz edilmiştir.

*Bulgular:* Araştırmanın sonucunda Slovak ilköğretim öğrencilerinin kuşlar konusundaki bilgilerinde önemli problemler olduğu belirlenmiştir. Ölçme aracının tüm boyutlarında öğrenci başarılarının düşük düzeyde olduğu görülmektedir. Bu başarısızlık tüm sınıf düzeylerinde ortaya çıkmaktadır. Çalışmada kız öğrencilerin başarılarının erkek öğrencilerin başarılarından anlamlı düzeyde yüksek olduğu görülmektedir. Diğer yandan yaşam çevrelerinin ve hayvana sahip olup olmama durumlarının öğrencilerin başarıları üzerinde anlamlı bir farklılık oluşturmadığı belirlenmiştir.

Araştırmanın sonuçlarına göre öğrenciler kuşlar konusunda çeşitli kavram yanılgılarına sahiptir. Bu kavram yanılgıları araştırmanın tüm alt boyutlarında (kuşların tanınması, kuşların üremesi, kuşların beslenmesi, kuşların duyuları ve kuşların göçleri) ortaya çıkmaktadır. Örneğin, penguenlerin vücudunun ne ile örtülü olduğu konusunda öğrencilerin sadece % 20'si doğru cevap vermiştir. Diğer öğrenciler, bu konuda farklı kavram yanılgılarına sahip durumdadır.

*Sonuç ve Öneriler:* Bu çalışmadaki bulgular, öğrencilerin fen derslerine hiçbir bilgi sahibi olmadan geldikleri düşüncesine karşı, öğrencilerin belli bir deneyim ile geldikleri görüşünü destekleyici niteliktedir. Öğrenciler sınıfa, günlük yaşamdaki deneyimlerine bağlı olarak kuşlar konusunda belli bir bilgi alt yapısıyla gelmektedir. Bu bilgiler çeşitli kavram yanlışlarını içinde barındırmaktadır. Bu çalışma okulda verilen eğitimin kuşlar konusundaki kavram yanlışlarının düzeltilmesinde yeterince etkili olmadığını ortaya koymaktadır.

Araştırmadan elde sonuçlara göre çalışmadaki alt boyutlarla ilgili, geniş örneklemli, farklı yaş aralığında ve kültürler arası araştırmalar yapılması yararlı olacaktır. Çünkü alanda uluslar arası ve kültürler arası çalışma gruplarının incelendiği çalışma yok denecek kadar azdır. Öğrencilerin kuşlarla ilgili bilgi eksikleri, yanlış bilgileri ve kavram yanlışları göz önüne alınarak bu eksiklikleri giderecek deneysel çalışmalar yapılabilir.

Araştırmada elde edilen bulgular ışığında öğrencilerin kuşlar konusundaki bilgilerini, algılarını ve kavramalarını arttırmak amacıyla şu öneriler sunulabilir:

1. Öğretim sürecinde daha çok resimlerden ve görsel materyallerden faydalanılmalı, çünkü ders kitapları genel olarak metin içeriklidir.
2. Ders kitapları genel olarak metin içerikli olduğu için öğretim sürecinde resimlerden ve görsel materyallerden daha çok faydalanılmalıdır.
3. Öğretim sürecinde deneylerden ve gözlemlerden yararlanılmalıdır.
4. Kuşları tanımak öğrenciler için ilgi çekici bir etkinliktir. Bu nedenle öğrencilere kuşları seslerinden yola çıkarak tanıtan çalışmalar yapılabilir veya öğrencilerin kuşları tanıyabilecekleri farklı öğretim yöntemleri geliştirilebilir.
5. Öğrencilerin kuşlarla ilgili çalışmalarının yanında diğer hayvanlar veya diğer canlılarla ilgili, kavramsal düzeyde, farklı veri toplama tekniklerinin kullanıldığı araştırmalar yapılabilir.
6. Kuşların tanınması ve yaygın kavram yanlışları hakkında sınıflarda tartışmalar yapılabilir. Bazı araştırmacıların önerdiği gibi, kuşlar konusunda öğrencilerin ilgisini çekmek için kavram karikatürleri kullanılarak öğrencilerin konu hakkında fikirleri değiştirilebilir ve bilinç düzeyleri artırılabilir.

Bu çalışmada ilköğretim öğrencilerinin kuşlar konusundaki kavram yanlışları ile ilgili yeni bilgiler sunulmuştur. Bu bilgilerin fen eğitimi araştırmacıları ve öğretmenler tarafından değerlendirilmesi ve öğretim sürecinde kullanılması yararlı olacaktır.

*Anahtar Sözcükler:* kuşlar; ilköğretim öğrencileri; bilgi testi; kavram yanlışları