

Lower Secondary School Pupils' Knowledge and Attitudes Toward Butterflies and Mosquitoes

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Abstract

Butterflies are traditionally considered popular and favourite animals and conversely mosquitoes are perceived as unpopular animals, which can cause injury to humans in the form of bite. The purpose of this study is to compare attitudes and knowledge about the mosquito and the butterfly among elementary school pupils from Slovakia and Czech Republic. The sample size consisted of 614 pupils from six elementary schools with conventional style of education. The age of pupils was between 10 of 15 ($\bar{x} = 12.62$; $SD = 1.39$). They attended lower secondary basic education (according to ISCED). Boys created 51.47 % ($n = 316$) and girls created rest of sample ($n = 298$). Pupils' knowledge and attitudes toward mosquitoes and butterflies were measured on 5-point items of Likert type. The questionnaire consisted of 78 items, 39 for mosquito and 39 for butterfly, 26 items were focused on attitudes and 13 for knowledge, for each animal species. We found that the butterfly was relatively more positively perceived in comparison with the mosquito and pupils achieved better score about butterfly compared with the mosquito. Implication for the education and research are discussed in the last part of contribution.

Key words: attitudes, butterfly, knowledge, mosquito, pupils

Introduction

People value animals according to their shape and other important characteristics such as their usefulness or harmfulness. Animals' behaviour is an important characteristic, as it will be perceived in a positive or negative way by humans. It is obvious, children tend to place value in positive meaning animals, which have beauty and they tend to avoid animals which are morphologically and behaviourally unlike humans like spiders (Kellert 1993; Lindemann-Matthies 2005). Bjerke & Ost Dahl (2004) found that people most like small animals like small birds, squirrels, dogs, etc., and dislike invertebrates such as bats, rats and mice. This fact could be caused by the shape of the animal and their potential danger for humans. From the dangerous consequences the fear from animals arises. Fear from animals has been traditionally viewed as a biological predisposition that associates humans with potentially dangerous animals with fearful consequences (Seligman 1971). Fear is traditionally followed by various myths that are more or less appreciated by humans. Myths are identical with alternative conceptions (Prokop, Tunnicliffe 2008) which are often cultural and can be characterized follows: Alternative conceptions are robust with respect to age, ability, gender and cultural boundaries. They typically serve a useful function in the everyday lives of students, their families and their teachers. Alternative conceptions are often tenacious and resistant to change by conventional teaching strategies. They successfully interact with knowledge presented in formal instruction and often resemble those of previous generations of scientists and natural philosophers. Alternative conceptions are products of personal experiences or the mass media as well as formal instructional interventions (Mintzes, Wandersee, 1998). From the perspective of science education, myths or alternative conceptions are especially important in the case of the least popular animals such as snakes, spiders or insects, because learners' concepts and/or behaviour towards these animals can be influenced by the negative attitude (Prokop, Tunnicliffe 2008). The problematic of myths and their relationship is more detailed described in the study of Bickhard (1992).

The comparison of attitudes and knowledge toward two different animals is rare in educational research. One study was focused on the finding of children's attitudes toward predator and prey in the example of the wolf and the rabbit. Younger children (10 – 11 years) showed a significantly more positive attitude toward rabbits in comparison with wolves, but as children's age increased, the difference in average score disappeared and positive attitudes toward animals decreased. Also there were comparison of girls and boys. Girls perceived positively rabbit in comparison with boys and boys showed more positive attitudes toward wolf than did girls (Prokop, Kubiato 2008). The next study compared three relatively popular animals (rabbit, ladybird beetle and squirrel) and three unpopular animals (wolf, potato beetle and mouse). Results showed that children had better knowledge of, but less favourable attitudes towards unpopular animals compared with popular animals. Girls showed more negative attitudes toward unpopular animals in comparison with boys (Prokop, Tunnicliffe 2010). Other studies were focused on the attitudes toward animals in general or attitudes toward relatively unpopular animals. Phillips and McCulloch (2005) explored cultural differences in students' attitudes towards animal sentience and attitudes towards the uses of animals. The next study was focused on exploring children's attitudes toward spiders.

In this study were compared two countries – Slovakia and South Africa. Slovakian students have had a lower fear of spiders in comparison with African students (Prokop, Tolarovicova, Camerik, Peterkova 2010). A specific way to investigate attitudes toward animals and factors influencing these attitudes has been proposed by Stephen Kellert (Kellert, 1976, 1985, 1993; Kellert and Westervelt, 1983). Kellert developed a descriptive analysis of nine fundamental attitudinal ‘types’ (Kellert, 1976). He also identified important changes in the development of children’s perceptions of animals and found three transitions (Kellert, 1985). The first transition, (6 – 9 years of age) involves changes in affective and behavioural variables. The second transition from 10 to 13 years of age is typified by a major increase of cognitive abilities. The third transition (13 – 16 years of age) embraces an ethical concern and ecological awareness of the role of animals in their natural habitats.

Purpose of study

The purpose of this study is to compare attitudes and knowledge about the mosquito and the butterfly among elementary school pupils from Slovakia and the Czech Republic. In this study a mosquito is considered to be an unpopular / unsympathetic animal and a butterfly is considered to be a popular or sympathetic animal among people. Mosquitoes and butterflies are common animals occurring in the area of human habitations. Mosquitoes are generally considered to be harmful animals, which suck blood and leave itchy red bumps. Most people do not see any importance in this kind of animal, as they always kill them without thinking about the mosquitoes’ significance. On the other hand, there is another group of animals called butterflies. People are evaluating these animals as more positive in comparison with mosquitoes. This is probably caused by the colored wings of butterflies. Due to this attribute butterflies are caught by collectors. This activity has caused some species to be endangered and some have disappeared from Slovakia and the Czech Republic. We were interested in knowledge and attitudes of butterflies and mosquitoes among elementary school pupils. We focused on finding differences between gender of respondents.

The age of participants was 10 to 15 years. This age group was chosen, because we think this age is critical to children in development of positive or negative attitudes toward animals, and that this may be utilized in humane education because the age range embraces two developmental stages and the transition from one to the other.

This contribution explores the following question:

1. What are the children’s attitudes toward butterflies and mosquitoes?
2. What are the children’s knowledge about butterflies and mosquitoes?

Our hypotheses were:

1. Children have more positive attitudes toward butterflies and less positive attitudes toward mosquitoes.
2. Children have more knowledge about mosquitoes and less knowledge about butterflies.

Methods

Participants

The sample consisted of 614 elementary school pupils attending Slovakian and Czech schools with conventional style of education. This style of education is typical for the majority of schools in the Czech Republic and Slovakia. Selection of participants was not intentional, but was based on teachers' willingness to administer questionnaires in selected schools. In all cases, teachers administered questionnaires to all pupils in classes, independently to the pupils' attitudes toward animals. The age of pupils was between 10 of 15 ($x = 12.62$; $SD = 1.39$). They attended lower secondary basic education (according to ISCED), 42 pupils were from 5th grade, 173 from 6th grade, 136 from 7th grade, 152 from 8th grade and 111 from 9th grade. Boys created 51.47 % ($n = 316$) and girls created rest of sample ($n = 298$).

Construction of questionnaire

Pupils' knowledge and attitudes toward mosquitoes and butterflies were measured on 5-point items of Likert type (Likert 1932). For attitude items, we used a modified version Prokop and Kubiátko's (2008) Rabbit – Wolf Attitude Questionnaire, which is based on Kellert's (1985) attitude toward animals scale.

The questionnaire was divided into three parts. The first part consisted of demographic variables like gender, age, class, residence and pet ownership. The second part was comprised of knowledge and attitude items about mosquito and the third about butterfly. The original form of the questionnaire was developed in the Slovak language and then was translated into English for publication purposes with the assistance of a native speaker, who was an expert in biology education.

The attitude items were identical for both animals, except for the names of the animals, which allowed us to use the data in pair-wise comparisons. There are some examples of attitude items: "I would like to read a book about mosquitoes." or "Butterflies are interesting live organisms.". Knowledge of the mosquitoes and butterflies was measured using self-constructed items that represented basic facts about the animals' biology and behavior. These items were focused mainly on the feeding habits, reproduction and ecological relationships of animals. Items were similar for each animal species. Some examples of knowledge items include: "Butterflies breathe by lungs." (False); "Mosquitoes can carry diseases, like malaria." (True).

The order of items was presented randomly. Items were not grouped together with other items having a similar character. The questionnaire consisted of 78 items, 39 for mosquito and 39 for butterfly, 26 items were focused on attitudes and 13 for knowledge, for each animal species. Items were scored by participants from 1 (strongly disagree) to 5 (strongly agree). There were items worded both positively (I would like to read a book about mosquitoes) and negatively (I hate butterflies). Negative items were scored in reverse order, resulting in more positive attitudes being represented by higher mean score. The total score of individual participants provided a composite index of knowledge and attitudes toward

mosquito and butterfly. A low score reflects a relatively negative attitude and low knowledge and a high score reflects a relatively positive attitude and good knowledge about animals.

The validity of the questionnaire was established through review by experts in the field of zoology of invertebrates, didactic of biology and elementary school teacher. Reviewers were asked whether the items were relevant to the aim of the study and if the items were understandable for the pupils. Revisions were based on their comments and suggestions.

Procedure

Questionnaires were administered in six Czech and Slovak elementary schools. Pupils were reassured that the questionnaire was anonymous and not a test. The order of administering was random. No time limit was given during completion of questionnaire, but the longest time taken to complete it was about 20 minutes. The distribution of questionnaires was done by teachers who were instructed about its distribution. All questionnaires (n = 614) were filled correctly and were included into the analysis.

Statistical procedure

The knowledge and attitude score were subsequently submitted to factor analysis with Varimax rotation and three factors / dimension were derived for each animal. The three dimensions represented in the rotation matrix are: 1. Knowledge (A male and female mosquito feed on human blood); 2. Scientific dimension (The higher attention should aim on mosquitoes' protection); 3. Naturalistic dimension (It would not mind, when I hold mosquito in my hands). Items relating to attitudes are included in two dimensions (scientific and naturalistic), which were called on the basis of Kellert's work (1985) and on the basis of items' character. In this contribution, we evaluated only knowledge and attitudes part. The scientific and naturalistic dimensions were included in the attitudes part. From the next analysis was 8 items deleted due to lower factor score than 0.30 (Anastasi and Urbina 1997), or the item was loaded in more than one dimension or was loaded in another dimension of butterfly and in another dimension of mosquito.

The reliability of the questionnaire was calculated using Cronbach's alpha coefficient. Questionnaire showed high reliability of items (Cronbach's alpha for butterfly = 0.83 and for mosquito = 0.71). The high value of reliability coefficient in our study denotes that the instrument used for investigation pupils knowledge and attitudes toward butterfly and mosquito is reliable and its usage for further analysis is appropriate. Questionnaire was divided on two parts for both animals and the values of reliability are followed: α (butterfly attitudes) = 0.81; α (mosquito attitudes) = 0.76; α (butterfly knowledge) = 0.56; α (mosquito knowledge) = 0.41. The values of alpha for two last dimension are seem to be relatively low, the some resources quoted, the alpha higher than 0.40 for subscales is sufficient (f.e. Marino and Stuart 2005).

On the statistical evaluation was used t-test, which found differences between children's attitudes and knowledge toward butterfly and mosquito.

Results

Attitudes and knowledge toward butterfly and mosquito

We found that children showed more positive attitudes toward sympathetic animal, in our case the butterfly, and also better knowledge butterfly. When we compare attitudes toward mosquito and butterfly, we found a statistically significant difference in attitudes toward butterfly and mosquito ($t = 30.66$; $p < 0.001$). The attitude score toward butterfly was higher ($x = 3.87$; $SD = 0.73$) in comparison with mosquito ($x = 2.69$; $SD = 0.61$). Pupils achieved the lowest score from butterflies' items in the item "I would like to read a book about butterflies" and in the second one "I would like learn more about butterflies in biology lessons". The mean score from both items was 3.00. Pupils are not afraid of butterflies. Their mean score was 4.60. Next two items regarding the butterfly were evaluated by higher score ($x = 4.70$). Both items were regarding to fear from animal: "When I imagine a butterfly, it shakes me" and "I would be scared, if a butterfly flies near by window". The mean score showed, pupils have not got fear from butterfly. None of the items about butterfly was evaluated fewer than 3.00. So, the butterfly is perceived as a sympathetic animal.

The mosquito was not perceived so positive in comparison with butterfly (figure 1). The similarity of score with butterfly was in the items regarding to fear from mosquito. Pupils achieved high score in the items: "I would be scared, if a mosquito flies nearby window"; "I would be scared to go to room, when the mosquito has been flown" and "I am afraid of mosquitoes". In all these items the score of pupils was more than 4.00, on the basis of this fact we can say, children have not got fear from mosquitoes either inside or outside. The lowest attitude score was in the items regarding to sympathies to mosquitoes: "I like mosquitoes"; "Mosquitoes are sympathetic live organisms" and "All mosquitoes should be protected by law". The score was for each of items lower than 2.00. So we can say that mosquitoes are not such sympathetic animals in comparison with butterflies for the elementary school pupils.

Pupils achieved higher score from knowledge part in butterflies' items in comparison with mosquitoes' items and this difference was statistically significant ($t = 5.85$; $p < 0.001$). The knowledge score of butterfly was $x = 3.62$ ($SD = 0.46$) and knowledge score of mosquito was $x = 3.48$ ($SD = 0.40$). Pupils achieved the lowest score ($x = 3.00$) in the item regarding overwintering of butterflies. Pupils had problems to determining if some species of butterflies stay during winter in cellars or not. Pupils also had problem with determining the season that female butterflies are laying eggs. The mean score in item "Female butterflies lay eggs during autumn" was 3.10. However, the next item was relatively easy for pupils, in the item "Caterpillars are equal to butterflies grubs" achieved pupils a mean score 4.00. The item with highest score was regarding to the activity of butterflies. Pupils know that there exists species of butterflies, which are active also during night. The mean score was 4.10. But there was found a very interesting situation. The previous item achieved the highest score in butterfly, but the same item regarding the mosquito was scored the lowest mean score ($x = 1.80$). Pupils considered the mosquito only for diurnal animal, only a small proportion of students knew that mosquito is active also during night. Next two problematic items regarding the mosquito were focused on reproduction of mosquitoes. Half of students considered autumn as the

season when mosquitoes are laying their eggs and only half of respondents knew female mosquitoes lay eggs into water. The relatively high score ($x = 4.10$) was found out on the answers on two items. In the first, pupils knew mosquitoes carry diseases like malaria and in the second pupils correctly determined the surroundings of water areas as a place of mosquitoes' occurrence. The highest score ($x = 4.40$) was found out in the item "Mosquitoes do not bite certainly". This fact is probably caused by pupils' experiences with mosquitoes.

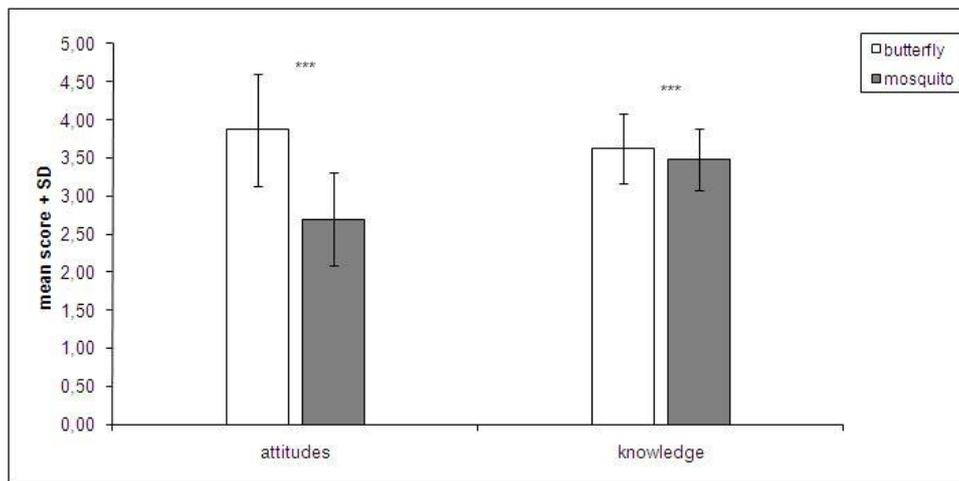


Figure 1. Mean attitude and knowledge score for butterfly and mosquito, *** $p < 0.001$

Gender differences in knowledge and attitudes toward mosquito and butterfly

When we compare attitudes toward two animals (mosquito and butterfly), we found out more positive attitudes toward butterfly of female in comparison with male (figure 2) ($t = 5.45$; $p < 0.001$). The female achieved a mean score $x = 4.04$ ($SD = 0.68$) and male achieved mean score $x = 3.72$ ($SD = 0.76$). Attitudes toward mosquito were lower in comparison with butterfly. The male achieved statistically significant higher score in comparison with females (figure 2) ($t = 5.66$; $p < 0.001$). The mean score of males was $x = 2.82$ ($SD = 0.58$) and females achieved mean score $x = 2.55$ ($SD = 0.61$).

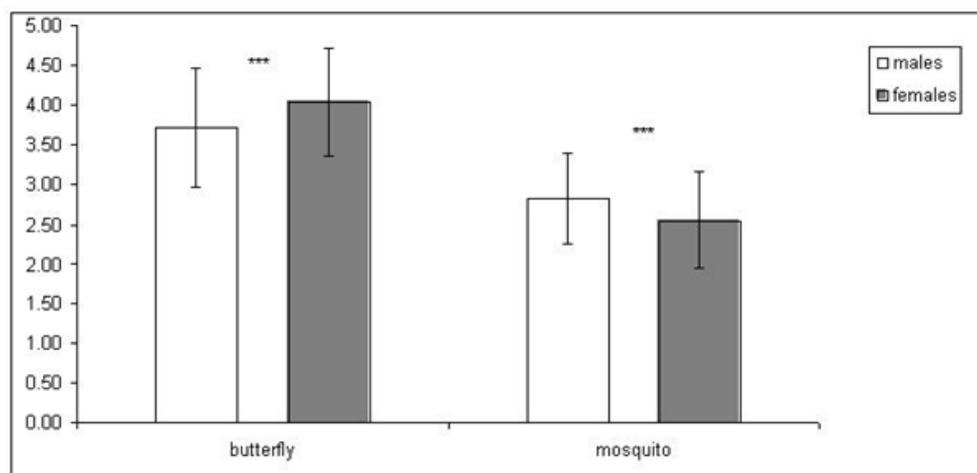


Figure 2. Mean attitude score for butterfly and mosquito with respect to gender, *** $p < 0.001$

In the analysis of knowledge we found a similar situation as in the analysis of attitudes. Females were more successful in the knowledge items regarding the butterfly (figure 3), but this difference was not statistically significant ($t = 1.51$; $p = 0.13$). The mean score of females was $x = 3.65$ ($SD = 0.44$) and males achieved a mean score $x = 3.60$ ($SD = 0.48$). The knowledge score of mosquito was in comparison with butterfly at males and females. The difference was not statistically significant ($t = 0.23$; $p = 0.82$). The score was almost similar for males and females, but males achieved higher score ($x = 3.48$; $SD = 0.43$) in comparison with females ($x = 3.47$; $SD = 0.38$) (figure 3).

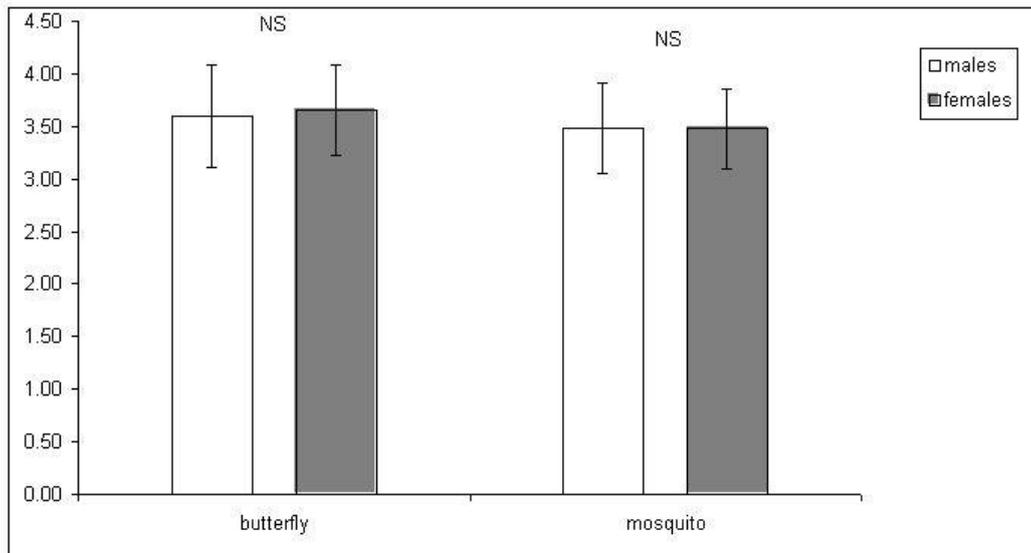


Figure 3. Mean knowledge score for butterfly and mosquito with respect to gender, NS not statistically significant difference

Discussion

Analysis of pupils' knowledge and attitudes toward a model sympathetic and unsympathetic animal, in the examples of butterfly and mosquito, show the butterfly was relatively more positive perceived in comparison with mosquito. Generally, pupils expressed rather positive or neutral attitudes toward both butterfly and mosquito. We can accept the first hypothesis because the butterfly was perceived as more positive in comparison with mosquito. Our finding is consistent with other investigations. Butterflies are relatively harmless for humans. Children have experiences with diurnal butterflies, which are coloured and do not bite them. Butterflies are introduced in the form of collections in museums and schools, of course. This group of animals is many times portrayed in books, movies and children magazines as positive and kind animals. These facts contribute to the positive perception of butterflies. Mosquitoes are perceived in negative meaning, particularly due to biting. This fact is supported by Driscoll (1995), who investigated mosquitoes belong among the most unpopular animals. Butterflies, in our study, were perceived in positive and mosquitoes were evaluated in neutral meaning. The more negative attitudes toward mosquitoes could be caused by the fear from this animal. Fear from mosquito is probably caused by their ability to bite and suck blood. Some investigations showed negative attitudes toward animals, which are caused by the fear from these animals (Batt 2009; Knight 2008).

We rejected our second hypotheses because pupils got better scores about butterfly in comparison with mosquito. We came out from the study of Prokop and Tunnicliffe (2010), where the authors investigated better knowledge about unpopular animals in comparison with popular animals. Examples of unpopular animals were mouse, potato beetle and wolf and the examples of popular animals were squirrel, ladybird beetle and rabbit. Our finding could be supported by children's own experiences with the animals or information gathered from the sources like TV, magazines or books. And as Bartoczeck and Tunnicliffe (2009) showed children have knowledge of insects and invertebrates they observe during their everyday life and have particular sources of this knowledge. Their results showed the importance of informal education outside of formal education. The pupils' experiences are in more ratios with butterflies. Butterflies are bigger and more coloured in comparison with mosquitoes. They are easily observed in comparison with mosquitoes. Mosquitoes are smaller; their occurrence is influenced by water, so they are not as easily observed as butterflies. On the basis of these facts, pupils are more confronted with butterfly, so their knowledge and interest about this animal could be caused by this.

Part of the results was focused on the pupils' knowledge and attitudes toward butterfly and mosquito with the respect toward gender. Girls showed more positive attitudes toward butterfly and more negative attitudes toward mosquito. A similar situation also existed for knowledge. Girls achieved higher score for butterfly and lower score for mosquito in comparison with boys. The results suggest greater preferences amongst girls for the less dangerous animals in comparison with boys (Prokop and Tunnicliffe 2010). Our finding is in line with previous studies that have found a greater emotional affection of girls for more attractive animals and a greater interest in wildlife among male children (Lindemann-Matthies 2005). However, as it is showed above, fear can be a factor which influences knowledge and attitudes toward animals. Lower attitude and knowledge about the mosquito could be caused by greater fear of females toward mosquitoes in comparison with males. A similar finding is showed in the study of (Prokop and Tunnicliffe 2010).

Conclusion

In our study we focused on pupils' knowledge and attitudes toward butterfly and mosquito. In our case the butterfly represented a popular animal and the mosquito an unpopular animal. Next we were focused on finding differences between gender. Our results confirmed the general public view that mosquitoes are perceived as unpopular and harmful animals and butterflies are perceived as pretty and popular animals. Our results suggest that knowledge and attitudes toward mosquitoes are more negative and lower in comparison with butterflies. However, we have to become aware of every animal playing an important role in the ecosystem and contributing to the biodiversity and ecological stability of nature. The bad image of mosquitoes is linked to non-supportive ecological attitudes which consequently may influence their protection and later cause extinction. On the basis of previous ideas we are trying to design several implications for education:

- children are not sensitive to the balance of nature and they think mosquitoes are “bad” and butterflies are “good”. There is necessity for teachers to tell pupils about the significance of both animals in nature.
- teachers should focus not only on formal education but also on informal education, for example different environmental programs regarding the significance of all animals occurring in some environment (eg. river or lake). This would have a positive effect on pupils attitudes toward “bad animals” like mosquitoes have.
- the learning process should be run not only in classrooms, but teachers should use the environment. As Zoldosova & Prokop (2006) showed the learning process running outside significantly influenced the students fear and interest in controversial animals.
- there is chance, that results of our investigation may provide useful information in guiding curriculum development, especially for educators concerned with ecology and the behavior of animals.

We were not able to investigate all aspects which influence pupils’ attitudes and knowledge toward unsympathetic and sympathetic animals (in our case mosquito and butterfly), in this research. Further research on this field of study is necessary.

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