ACTA BIOLOGICA SLOVENICA
LJUBLJANA 2008 Vol. 51, Št. 1: 33–38

Sprejeto (accepted): 13. 10. 2008

How are Age and Gender Related to Attitude Toward Plants and Animals?

Kako sta starost in spol povezana z odnosom do rastlin in živali?

Jelka STRGAR
University of Ljubljana, BF, Department of Biology, Večna pot 111, SI-1001 Ljubljana, Slovenia;
E-mail: jelka.strgar@bf.uni-lj.si

Abstract. The article examines attitude towards plants and animals in a population of 210 pupils aged 9 to 18. The results support the proposition that animals are generally more interesting to pupils than plants. Their interest was strongly influenced by age, while gender-based difference was only one.

Key words: plants, animals, age, gender, attitudes, plant blindenss

Izvleček. Prispevek obravnava odnos 210 učencev, starih 9 do 18 let, do rastlin in živali. Rezultati podpirajo predpostavko, da se zdijo živali učencem v splošnem zanimivejše od rastlin. Na zanimanje učencev je močno vplivala njihova starost, medtem ko smo razliko med spoloma našli eno samo.

Ključne besede: rastline, živali, starost, spol, odnos, slepota za rastline

Introduction

We live in an "anthropocentric culture which assigns utilitarian value to other life forms" (Schneecloth 1989). Nevertheless, organisms provide a good starting point for grounding a student's interests in biology. At the same time direct contact with various living beings provides information and experiences that are not obtainable by reading, viewing static or moving pictures, or examining a model. Work with living, authentic materials is therefore a necessity in biology education.

People's attitude towards other living beings was always a matter of interest; many researches have studied it and written about it. In this context they also examined attitudes towards animals versus plants. Namely, research showed that in general people find animals more interesting than plants (Wandersee 1986, Kinchin 1999). In 1998 Wandersee and Schussler even introduced the term plant blindness (Wandersee & Schussler 1999), defined as the inability to see or notice the plants in one's environment, the inability to recognize the importance of plants, the inability to appreciate their aesthetic and biological features, and the anthropocentric ranking of plants as inferior to animals.

Earlier attempts to explain this attitude toward plants in comparison to animals included different aspects. Hershey (1992) quoted a number of articles showing that plants were rarely used in biology education. The authors gave five reasons for this situation: (a) the majority of people feel that animals are superior to plants; (b) teachers find plants less interesting than animals; (c) teachers are better prepared to teach about animals than plants; (d) textbooks contain less information on plants than animals; and (e) pupils prefer animals to plants. According to Hershey (1993) this was a case of a chain reaction: since biology teachers received little botany education, they themselves excluded plants from lessons to a great extent.

Various authors (Tunnicliffe & Reiss 2000, Wandersee & Schussler 2001) found that children in many countries seemed to be primarily animal-socialized because the majority of children's cartoon characters, books, shaped confectionary, stuffed toys, team mascots, songs, or games pay homage to animals and not to plants or other life forms.

Based on the literature and their own research Wandersee & Schussler (2001) came to the conclusion that all the previously stated reasons for neglecting plants in comparison to animals might be only secondary, a consequence of "the way that humans perceive plants-due to the inherent constraints of their visual information processing systems". They found it better to rely on the principles of human visual perception and visual cognition when looking for reasons for plant blindness. Schneecloth (1989) came to a similar conclusion. According to her it was the pervasiveness of the experience of vegetation that structured its position in human perception as a background. For that reason we do not notice plants but what differs from them, for instance the clearing in the forest or the edge of the woods.

Research established the existence of gender- and age- related differences concerning an interest in learning about animals and plants (Baird & al. 1984, Wandersee & Schussler 1986).

The literature therefore suggests that people hold different attitudes towards animals versus plants and that gender and age affect interest in individual objects. We therefore proposed to test the following three hypotheses:

- Pupils are more interested in animals than in plants.
- There are no differences between the genders regarding interest in animals and plants.
- There are no differences between age groups regarding interest in animals and plants.
- The above mentioned studies investigated gender- and age- related differences concerning interest in learning about animals or plants, while we proposed to test the attitude toward specific living beings.

Material and methods

In the experiment 210 pupils of three age groups took part:

- 67 pupils aged from 9 to 10 (4^{th} grade of elementary school),
- 86 pupils aged from 13 to 14 (8^{th} grade of elementary school),
- 57 pupils aged from 17 to 18 (grammar/high school).

All the schools in the project were urban schools. The students attending them came from different social backgrounds but the chi-square test among groups of the same age did not show statistically significant differences ($p < .05$). In the sample there were slightly more girls (54.8%) than boys (45.2%). Elementary school and grammar school were chosen because they are attended by the most general population which is least interest oriented. It is true that pupils in grammar school finished elementary school with better grades, but in our opinion this fact did not impact the results of our research which only focused on the attitude toward living beings, not on knowledge about them.

Twenty objects (plants and animals; Tab. 1) were used in the test, selected according to the following basic criteria: the objects should not be dangerous to people taking part in the test; they are clearly visible to the naked eye; are convenient for handling; and, since the test was conducted in schools, suitable for transportation. An additional selection criterion was the supposed attractiveness of the objects, based on our experience with pupils and previous research. These showed animals to be more attractive than plants, so we selected only 5, in our opinion not very attractive, animals. The remaining 15 objects were plants, 9 of them supposedly attractive and 6 unattractive.

One specimen (or its part) was used for each of the 20 animal and plant species, with the exception of the yellow meal worm beetle where around 100 larvae were used.

The 20 test objects were distributed randomly in the class, and set up in such a way the pupils were able to see each of them clearly and to touch or handle them. All the animals and cabomba that required containment were displayed in transparent glass containers without lids. The pupils were able

Table 1: List of objects
Tabela 1:

	Common Name	Scientific Name	Description
1.	Mongolian gerbil	*Meriones unguiculatus*	
2.	Fire salamander	*Salamandra salamandra*	
3.	Gambusia	*Gambusia* sp.	
4.	Indian stick-insect	*Carausius morosus*	
5.	Yellow mealworm beetle	*Tenebrio molitor*	Larva
6.	Pitcher plant	*Nepenthes* 'Coccinea'	
7.	Sundew	*Drosera aliciae*	
8.	Cactus	*Haageocereus versicolor*	Cylindrical, bearing artificial blooms
9.	Cactus	*Haageocereus versicolor*	Cylindrical, without blooms
10.	Cactus	*Mammillaria* sp.	Round, soft haired
11.	Formosa azalea	*Rhododendron simsii*	In bloom
12.	Formosa azalea	*Rhododendron simsii*	Without blooms
13.	Osage orange	*Maclura pommifera*	Fruit
14.	Artificial squash		Fruit
15.	Himalayan blue pine	*Pinus wallichiana*	25 cm long cone similar to *Pinus strobus* cone
16.	Eastern white pine	*Pinus strobus*	10 cm long cone
17.	Cutleaf teasel	*Dipsacus laciniatus*	Dry inflorescence on a stem
18.	Banana plant	*Musa* sp.	
19.		*Rhoicissus digitata*	
20.	Cabomba	*Cabomba caroliniana*	

to move among them freely for 10 minutes. The only explicit oral instruction was that they should observe the objects, get to know them and not damage them. After 10 minutes the pupils had to answer the following question: How interesting do you find each of these objects? Pupils evaluated all 20 objects, rating them on a 5-point scale where 1 was "worst" and 5 was "best".

The Mann-Whitney U test was performed to test the gender and age differences in ratings.

Results and discussion

Our results supported the first hypothesis, that pupils find animals more interesting than plants, since they rated animals with an average rating of 4.0, and placed plants a bit lower, at an average of 3.2. The average value of plants was lowered by 9 objects that were given a rating below 3.3, which means they were less interesting than the least interesting animal in this experiment – the gambusia fish (rating 3.4). As far as interest is concerned, 4 plant objects were able to compete with gambusia fish: cylindrical cactus with artificial blooms, artificial squash, banana plant and cone of Himalayan blue pine. Two animals that rated somewhere in the middle (ratings 3.6 and 3.9) were larvae of yellow meal worm beetle and stick insect, and were on the same interest level as the most interesting plants: fruit of osage orange and pitcher plant. This means the most interesting plants were rated about a grade lower than the most interesting animals. The most interesting objects for both genders and all age groups were the Mongolian gerbil (rating 4.7) and the fire salamander (rating 4.5).

The second hypothesis that gender does not affect interest in individual objects was accepted. Only one statistically significant gender-related difference in rating the interest factor of animals and plants was found in the 4th grade (Man-Whitney U test; $z = 2.3884$, $P < 0.05$), but there were none in

8th grade and in grammar school pupils. It may be concluded that gender does not affect the attitude towards living beings.

There are suggestions in the literature however that girls are more likely than boys to express an interest in learning about plants (Baird & al. 1984, Wandersee & Schussler 1986).

The third hypothesis that the age of pupils does not affect interest in individual objects was rejected. The rating of the test objects was strongly influenced by age; statistically significant differences were found with most of the test animals and plants (Tab. 2).

Table 2: Statistical significance of the differences between answers of each age group, obtained by the Mann-Whitney U test ($p < .05$)
Tabela 2:

	Female			Male		
Object	**ES4/ES8**	**ES4/GS**	**ES8/GS**	**ES4/ES8**	**ES4/GS**	**ES8/GS**
1 Animal	2.2108			2.7907		
2 Animal					2.2161	
3 Animal	3.6378			2.1726	3.0792	
4 Animal				3.1289	4.1055	
5 Animal			2.1239			
6 Plant	2.7199	2.1372		3.6818	3.0947	
7 Plant	2.3815	2.9367		2.7304	3.4990	
8 Plant	3.6789	2.7863		4.0460	3.7556	
9 Plant	2.2079	3.1711		4.1393	4.8526	
10 Plant		2.7666		2.4883	3.4213	
11 Plant	2.9657	2.7309			2.4027	
12 Plant	2.1524			2.1995	2.8459	
13 Plant						
14 Plant						
15 Plant	2.0597					
16 Plant						
17 Plant	3.7475	2.8465			2.4023	
18 Plant	2.4507	2.8394		2.3496	2.8039	
19 Plant	3.8823	4.3219		3.4268	4.0356	
20 Plant	5.1609	3.2058		2.7028	3.3435	

Note: ES4 = 4th grade elementary school pupils; ES8 = 8th grade elementary school pupils; GS = grammar school pupils.

The 4th grade elementary school pupils rated 60 – 65% of the objects higher than 8-graders and 50 – 70% of the objects higher than grammar school pupils. The 8-graders gave slightly higher ratings than grammar school pupils. There was only one significant difference between the ratings of 8-graders and grammar school students. The conclusion is that living objects were most attractive to younger pupils, and that their interest then decreases with age. Our results are in line with the findings by Baird & al. (1984), who established that preference for learning about animals decreases as grade level increases. Baird & al. also noted that plant study preferences rose slightly as grade level increased. We did not find this connection in our research, in which the ratings for both plants and animals decreased with age.

The 4-graders also gave high ratings to many of the objects, which means that they showed less fluctuations in the object rating than the other two age groups. The interest area of younger pupils is

therefore less specialized and their attention is governed by more diverse factors. In contrast, older students responded more to objects that were exceptional and surprising, which aroused cognitive conflict (fire salamander, pitcher plant, fruit of osage orange, artificial squash and cone of Himalayan blue pine). As Kellert established (as cited in Thompson & Mintzes 2002), pupils' attitude changes over the course of their school years, ranging from focusing primarily on an emotional relationship towards animals (ages 6 to 9 years) to focusing on cognitive or factual understanding (ages 10 to 13 years), and finally to a view that embraces an ethical concern and ecological awareness of the role of animals in their natural habitats. It seems that pupils' attitude toward plants might also have a similar age-dependent pattern.

Conclusions

Plants do engage pupil interest, but a great deal less than animals. How do we apply this finding to the educational process, since it is a school's task to present plants and animals on equal terms? Our starting point should be the education provided for teachers – if the teachers truly appreciated the difference in attitude towards various living beings, they would adjust their own views and take them into account when planning lessons. In this way lessons would not be based so much on animals; a competent teacher will also find enough interesting plants or ways to make plants attractive. For instance, on field trips pupils are more easily motivated when introduced to a plant through its connection with a certain animal.

Only one statistically significant gender-related difference in rating the interest factor of animals and plants was found.

The age of pupils strongly influenced their interest in living objects. Both animals and plants were most attractive to younger pupils, their interest then decreasing with age. Younger pupils also seemed to be attracted by various factors, while older ones responded more to features related to cognition. We can therefore implement our notion that biology for the youngest pupils should be based on pleasant direct experience with a great variety of living beings. In this way the pupils can gain a positive attitude towards the living world through emotions, and form a strong foundation on which they can build more abstract, higher level knowledge that will help them understand nature.

Literature

Baird J. H., R. Lazarowitz & V. Allman 1984: Science choices and preferences of middle and secondary school students in Utah. *Journal of Research in Science Teaching,* **21** (1): 47–54.

Hatano G., R. S. Siegler, D. D. Richards, K. Inagaki, R. Stavy & N. Wax 1993: The Development of Biological Knowledge: A multi-National Study. *Cognitive development,* **8** (1): 47–62.

Hershey D. R. 1992: Making plant biology curricula relevant. *BioScience,* **42** (3): 188–191.

Hershey D. R. 1993: Plant neglect in biology education. *BioScience,* **43** (7): 418.

Inagaki K. & G. Hatano 1996: Young Children's Recognition of Commonalities between Animals and Plants. *Child Development,* **67** (6): 2823–2840.

Kinchin I. M. 1999: Investigating secondary-school girls' preferences for animals or plants: a simple "head-to-head" comparison using two unfamiliar organisms. *Journal of Biological Education,* **33** (2): 95–99.

Schneecloth L. H. 1989: "Where did you go?" "Forest." "What did you see?" "Nothing." *Children's Environments Quarterly,* **6** (1): 14–17.

Stark R. & H. Gray 1999: Gender preferences in learning science. *International Journal of Science Education,* **21** (6): 633–643.

Thompson T. L. & J. J. Mintzes 2002: Cognitive structure and the affective domain: on knowing and feeling in biology. *International Journal of Science Education,* **24** (6): 645–660.

Tunnicliffe S. D. & M. J. Reiss 2000: Building a model of the environment: how do children see plants? *Journal of Biological Education,* **34** (4): 172–177.

Wandersee J. H. 1986: Plants or Animals – Which do Junior High School Students Prefer to Study? *Journal of Research in Science Teaching,* **23** (5): 415–426.

Wandersee J. H. & E. E. Schussler 1999: Preventing Plant Blindness. *The American Biology Teacher,* **61** (2): 82–86.

Wandersee J. H. & E. E. Schussler 2001: Toward a Theory of Plant Blindness. *Plant Science Bulletin,* **47** (1): 2–9.