PRE-SERVICE BIOLOGY TEACHERS' ATTITUDE, FEAR AND DISGUST TOWARD ANIMALS AND DIRECT EXPERIENCE OF LIVE ANIMALS

Iztok Tomažič
Biotechnical faculty
University of Ljubljana
Ljubljana, Slovenia
iztok.tomazic@bf.uni-lj.si

Abstract: In 2006, the European Parliament published a framework of eight key competences for lifelong learning, each as "a combination of knowledge, skills and attitudes appropriate to the context". Biology teaching in Slovenian schools is primarily knowledge-oriented, less concerned with developing skills, and largely negligent of attitude as a constituent component of competences. This paper presents a research of attitudes, fear and disgust that first- and final-year pre-service biology teachers have expressed toward 25 animals, in connection with direct experience of individual animal species. Students' attitudes and emotions were assessed with a self-report questionnaire. Results show that final-year students on average rate their attitude higher (more positive) and fear and disgust lower (less negative) than their first-year counterparts. That applies mostly to animals which students encountered and worked with at biology didactics classes. Implications for biology education are discussed.

Keywords: animals, attitude, fear, disgust, pre-service teachers

Introduction

Every day, the media report about a number of endangered species and the reasons for their protection. There are many campaigns organised each year by different institutions to address this issue and present it to the public at large. The United Nations declared the year 2010 the *International Year of Biodiversity*. On its webpage, the UN says: "*It is a celebration of life on earth and of the value of biodiversity for our lives*" (http://www.cbd.int/2010/welcome/). The UN appeals to the world to take action to safeguard the variety of life on earth – biodiversity.

Schools have an important role in addressing this issue and presenting it to children. They inform children and thus influence their attitudes and future actions (behaviour). According to Kellert (1996), education plays a crucial role in creating environmentally conscious citizens. A similar view is held by the Society for Conservation Biology, which published Conservation Literacy Guidelines (Trombulak et al., 2004). The Society proposes that educators should seek to develop in people a deeper understanding of the importance and tools of conservation biology. What is important in its view is that education is the most effective when people develop knowledge, skills, and attitudes through direct experience. Also, conservation biologists, in their opinion, have a unique set of knowledge, skills, and concerns to share with others.

Not only conservation biologists but also biology teachers should be educated in such manner. Slovenian biology curricula stipulate that every person, in the course of their education, should acquire knowledge about main biology topics and at the same time develop appropriate attitudes toward these topics, nature and biology on the whole. Furthermore, during the course of their formal education, students should acquire as much direct experience as possible of various organisms and their living environments. To be able to provide children with such direct experience, student teachers (and teachers) need first develop appropriate attitudes with as little negative emotions toward organisms as possible. A biology teacher, for example, with an irrational fear of spiders or some invertebrate species would hardly be effective if working with such live animals.

It is well known that factual knowledge alone is not sufficient for developing appropriate attitudes and skills (Morgan, 1992; Prokop et al., 2009), especially when it comes to unpopular animals. (Prokop et al., 2009; Prokop and Tunnicliffe, 2010, Tomažič, 2008).

Morgan (1992) argues that in order to achieve a balance between knowledge and attitudes, a certain level of involvement and amount of information are needed. If students have the opportunity to work with live organisms, they can acquire the most vivid experiences and develop strong emotions about their subjects. Students can truly understand living things when they are allowed to have direct contact with them (Lock 1994, Lock & Alderman 1996). Direct experience, in contrast to indirect experience, differently influences attitude formation. Attitudes based on direct experience are known to be more persistent, stronger, held with greater certainty, more stable over time and more resistant to counter-influence (Fazio & Zanna 1981).

The most common reasons, as reported by teachers themselves, for not using live animals in the classroom include restrictive environmental and veterinary legislation, unfavourable public (and student) opinion, inadequate facilities, insufficient funding, problems with animal care, and restrictive school policies (Adkins & Lock, 1994). When teachers work with primary teaching materials (live organisms), they must frequently negotiate their own and students' interpersonal barriers that can significantly affect the quality of students experience (Adkins & Lock 1994, Bixler & Floyd 1999). Emotions such as fear and disgust affect teachers' attitudes towards animals and can affect their (non)use in the classroom. Studies of people's attitudes toward and knowledge of (familiarity with) different animals often focus on the general public or students, but seldom on future biology teachers (Thompson & Mintzes 2002, Barney & al. 2005).

The questions used for the purpose of this study were:

a) How many students have direct experience of animals at the beginning, and at the end of, their studies?

b) How do first-year and final-year pre-service biology teachers rate their attitudes, fear and disgust toward certain animals?

c) How does direct experience of individual animal species influence students' ratings of their attitudes?

d) How will animals be grouped in different categories as a result of factor analysis of students' attitude ratings?

Methodology

The study was undertaken in 2006 (with 51 first-year students and 41 final-year students), and in 2007 (with 48 first-year students). It included a total of 99 first-year and 41 final-year pre-service biology teachers, with the mean ages of 20.0 years and 23.2 years, respectively. The respondents were studying to become primary school biology (science) teachers. Most of them were female. As only six male students participated the data gathered was not analysed according to gender.

Attitudes and emotions were assessed using a self-report questionnaire which recorded the prospective teachers' attitude, fear and disgust toward 25 animals in connection with direct experience of individual animal species. All ratings were based on a five-point scale. The scale for fear was adapted from Davey et al. (1998). Self-report items about **fear** were rated on the following scale: 1 = 'I am not afraid of the animal.'; 2 = 'The animal sometimes frightens me.'; 3 = 'I am afraid of the animal.'; 4 = 'I am very afraid of the animal.'; and 5 = 'I am terrified of the animal.'. Self-report items about **disgust** were rated on the following scale: 1 = 'The animal is not disgusting.'; 2 = 'I have an unpleasant feeling when close to the animal.'; 3 = 'The animal is disgusting.'; 4 = 'This animal makes me sick.'; and 5 = 'This animal makes me vomit.'. And self-report items about **attitude** were rated on the following scale: 1 = 'I do not want anything to do with this animal.'; 2 = 'I do not like this animal.'; 3 = 'I do not have a special attitude toward this animal.', 4 = 'I like this animal.'; and 5 = 'I like this animal very much.'.

Data was analysed according to the year of study and student direct experience of animals. To further analyse data from the attitude part of the questionnaire, principal components analysis (PCA) with varimax rotation was used. After factor analysis, animals were grouped into five factors according to attitude ratings. Eigenvalue above 1.0 was used for the final factor solution. The Kaiser-Meyer-Olkin (KMO) measure of the sampling adequacy test (0.863) and Bartlett's test for sphericity ($\chi 2 = 1634.92$; df = 300; $p < 0.001$) suggested that factor analysis was appropriate for this data set, because the value of KMO exceeded critical value 0.7 (Leech et al., 2005). First factor explained 31.82% of total variance and all five factors explained 63.38% of variance.

The questionnaire focused mainly on animals that are usually harmless to humans and can be used in the classroom (e.g. snails, cockroaches, spiders, earthworms, leeches, amphibians), but can evoke relatively high disgust responses.

Findings and Discussion

Results show that final-year students on average rate their attitude higher (more positive) than their first-year counterparts (Figure 1). For example, only 30% of first-year students reported direct experience with the toad. In contrast, 95% of final-year students reported having direct experience of the same animal (Table 1). The difference between their ratings for attitude toward the toad was 1.0, while the differences between average fear and disgust ratings were 0.7 and 0.9, respectively.

Figure 1 represents changes in attitude, fear and disgust ratings according to the year of study. Animals are distributed according to descending average values of student ratings. Figure 2 represents differences in attitude ratings according to reported direct experience of individual animals.

According to factor analysis of attitude ratings, animals were grouped in five categories as shown in Figure 3: "Disgusting" (toad, frog, salamander, cockroach, spider, earthworm, snake, snail, leech, rat and scorpion); "Pets" (guinea pig, hamster, rabbit, cat, dog and mouse); "Fierce" (bear, wolf, and shark); "Sting" (fly, wasp and tick) and "Unusual Pets" (walking stick and turtle). Crombach alphas for individual factors were 0.91, 0.80, 0.83, 0.68 and 0.60, respectively. The differences in attitude ratings between students of different grades were found mainly for animals from the first factor ("Disgusting"). The only exceptions were the walking stick and the cat, which were ranked in separate factors (Figure 1, A). A comparison of student attitude ratings according to reported direct experience revealed additional differences for the rabbit, the mouse, the wolf and the turtle, but no differences were found for the cat (Figure 2).

Table 1: Differences in reported direct experience with animals between first- and final-year students.

ANIMAL	DIRECT CONTACT (*f*)						SIG.		
	First year			Final year					
	Yes	No		Yes	No		$\chi 2$		*p*
Guinea pig	93	6		40	0		4.181	*	***0.041***
Hamster	91	8		41	0		5.743	*	***0.017***
Snail	93	5		39	2		0.003	*	*0.956*
Snake	74	25		41	0		12.604		***<0.001***
Turtle	92	7		40	1		1.345	*	*0.246*
Salamander	34	64		37	4		35.697		***<0.001***
Toad	29	69		39	2		49.675		***<0.001***
Frog	63	33		38	3		10.858		***0.001***
Walking stick	77	19		41	0		9.421		***0.002***
Spider	85	14		39	2		2.835	*	*0.092*
Scorpion	14	85		27	14		37.438		***<0.001***
Cockroach	39	58		39	2		35.366		***<0.001***
Shark	6	93		0	40		4.181		***0.041***
Cat	99	0		41	0		NC		NC
Dog	99	0		40	1		NC		NC
Wolf	5	92		2	39		0.005	*	*0.946*
Bear	8	87		2	39		0.567	*	*0.451*
Mouse	75	22		38	3		4.586		***0.032***
Rabbit	98	1		36	5		7.952	*	***0.005***
Rat	74	25		21	20		8.861		***0.003***
Earthworm	87	12		39	2		1.913	*	*0.167*
Tick	96	3		40	1		0.038	*	*0.846*

Fly	98	1		41	0		NC		NC
Wasp	92	7		33	8		4.286	*	***0.038***
Leach	18	80		17	23		8.739		***0.003***

Notes: * Likelihood ratio; NC - Not calculated.

The research of the effect of direct experience of animals on the emotions and attitudes of studied subjects has been gaining increasing attention. Prokop et al. (2009) for one propose that in addition to learning facts about animals students should also be exposed to direct experience with animals, especially the ones that invoke negative emotions (e.g. fear). Schools are among the most important and influential institutions that can indeed provide such experience. This study has shown that (1) as a rule pre-service biology teachers gradually acquire more direct experience of animals as they progress towards the end of their university education, while (2) teachers' attitudes, fear and disgust change form negative to more positive (and less fear and disgust).

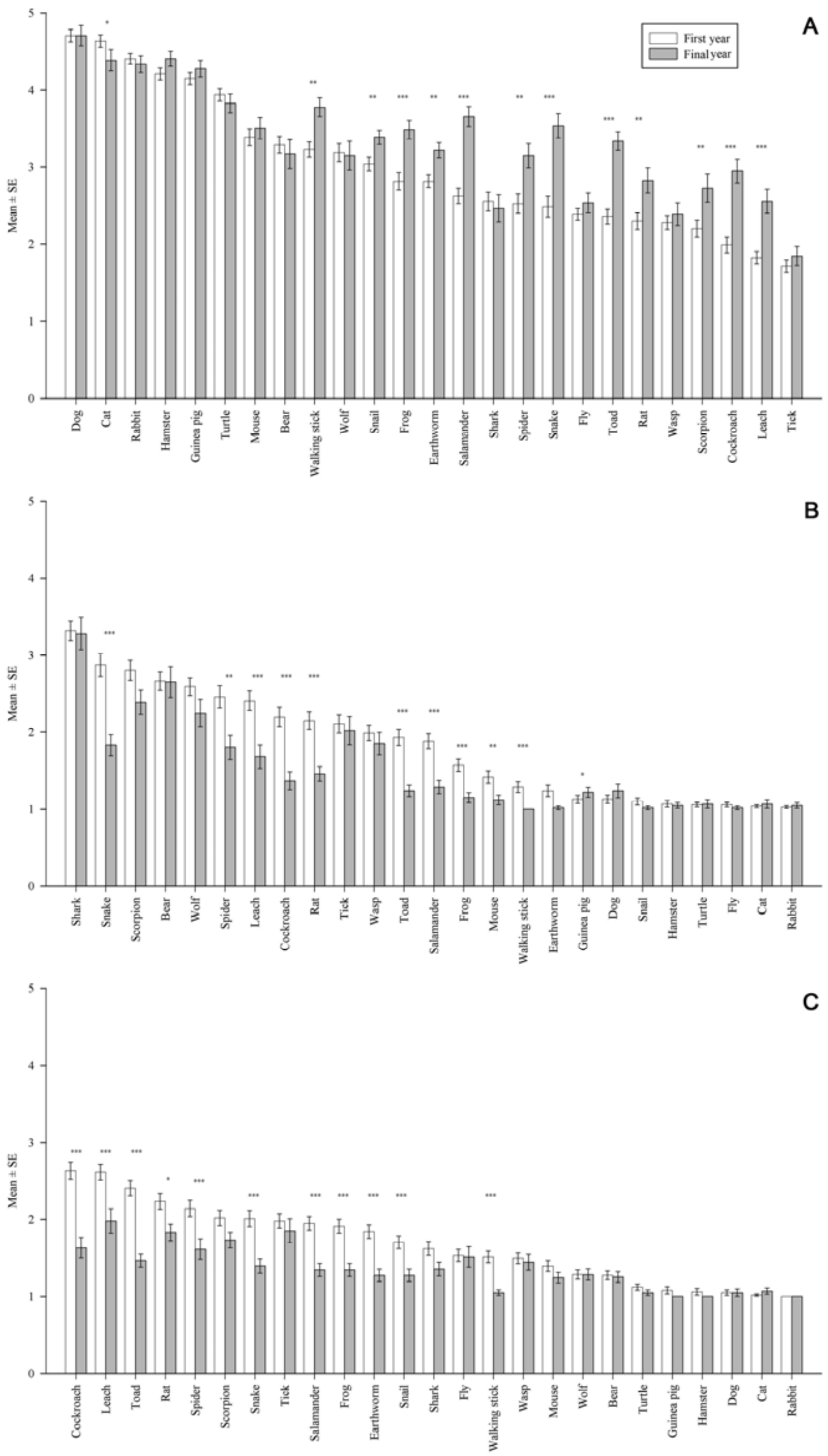

Figure 1. Differences in (A) attitude, (B) fear and (C) disgust ratings between first-year and final-year student teachers toward individual animals. Meaning of asterisks: Mann-Whitney U test; *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

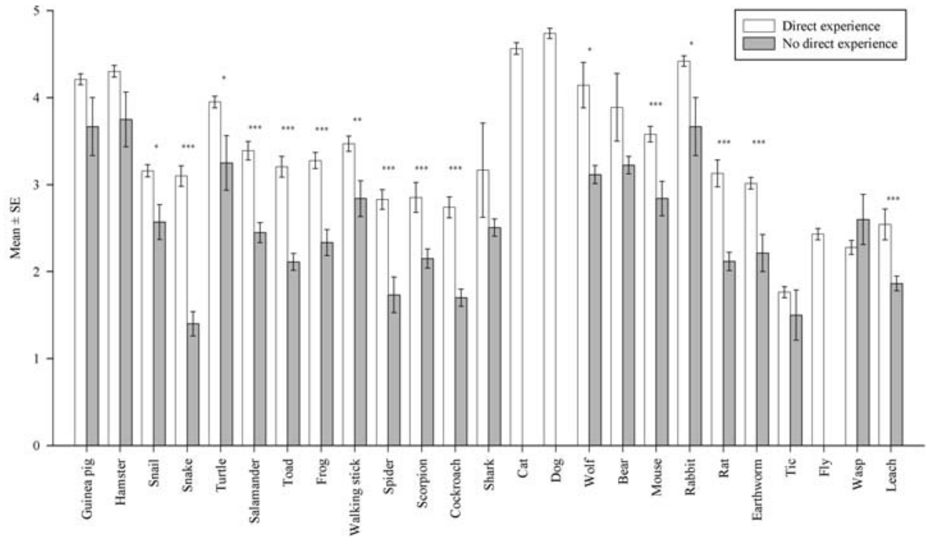

Figure 2. Differences in attitude toward different animals according to reported direct experience of student teachers. Meaning of asterisks: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

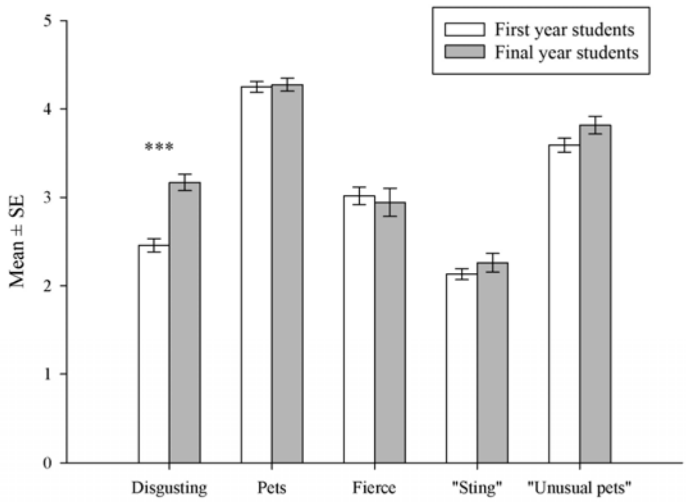

Figure 3. Differences in attitude toward different animals between first-year and final-year student teachers. Meaning of asterisks: *** $p < 0.001$.

(3) The analysis of attitude ratings revealed a change mainly in ratings for animals that can evoke a higher disgust response (for discussion cf. Davey et al., 1998, and Arrindell, 2000), which was confirmed by factor analysis of attitude ratings. (4) Reported direct experience with individual animal species influences student attitude ratings. Students with direct experiences of animals generally report better attitude than their counterparts. (5) Factor analysis of student attitude ratings grouped animals in five meaningful factors. These results yield to the conclusion that both direct experience with live animals and theoretical knowledge of animals are equally important. This was evident in ratings of animals that are usually harmless, but can evoke a greater disgust response, i.e. the animals which students encounter and extensively work with mostly in biology didactics classes (toad, salamander, frog, snake, spider, cockroach, scorpion). Students' attitude ratings of "Pets" were so high (positive) that this factor alone probably accounted for the lack of statistically significant differences. The same can be said for the "Unusual pets" factor, which included two animals, namely the walking stick and the turtle. There was also no change in attitude ratings toward animals that can be potentially dangerous and can cause physical injury (wolf, bear and shark). The same applied for animals that sting, i.e. can penetrate skin, such as wasps, flies or ticks. The last two factors suggest that in the future, there should be more

attention on working with such animals. Students must be aware that animals such as insects and fierce animals (wolves and bears) also play an important role in nature and that they should have positive attitudes toward them, too. Experiencing them would hopefully improve that (for a discussion about learning about insects see Shepardson, 2002).

Conclusion and Recommendation

Student teachers and schoolchildren alike need to directly experience a variety of animals and animal groups in order to gain first-hand experience. Such experience is believed to improve attitude and reduce negative emotions in students, who, with proper cognitive input, can consequently develop more pro-environmental behaviour. Only factual knowledge is therefore not sufficient. Future teachers should also have an opportunity to present different animals to their peers and schoolchildren of different ages. As a result of this, they might be more willing to include live animals in instruction once they become full-fledged teachers.

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