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PRE-SERVICE TEACHERS' FEAR OF SNAKES, CONSERVATION ATTITUDES, AND LIKELIHOOD OF INCORPORATING ANIMALS INTO THE FUTURE SCIENCE CURRICULUM

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Abstract. *Studying attitudes toward fauna such as snakes is essential in wildlife management. The main objective of this study was to investigate the impact that fear of snakes has on Slovenian pre-service teachers' attitudes towards conservation and the likelihood of incorporating animals into developing the future science curriculum. The effect of direct experience on fear of snakes, conservation attitudes, and the likelihood of incorporating snakes into the future science curriculum were also studied. Altogether, 352 full-time and part-time students majoring in preschool education and primary school education were surveyed. The study confirmed that students' fear of snakes negatively influenced their conservation attitudes and decreased the likelihood of incorporating snakes into the future science curriculum. Prior direct contact with snakes negatively correlated with fear of snakes, and positively with attitudes towards conservation and the likelihood of incorporating snakes into the future science curriculum. Prior direct contact with snakes also affected students' word associations regarding snakes by reducing the frequency of some associations that emphasize the potential threat snakes pose to people.*

Key words: *attitudes, conservation, fear, pre-service teacher, science education, snake.*

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Introduction

Snakes are among the most endangered animals in the world (Böhm et al., 2013). Gibbons et al. (2000) stated that habitat loss and degradation, introduced invasive species, environmental pollution, diseases and parasitism, unsustainable land use, and global climate change are the main causes for the worldwide decline of reptile species.

Likeability of a species and the extent to which the continuing existence of a species is endangered are major influences on the public's support for allocating funding for its conservation (Tisdell et al., 2007). Attitudes toward species that are feared and disliked cannot be easily reversed from negative to positive (Kaltenborn et al., 2006). Snakes are one of the most common objects of intense fears and phobias among people (e.g., Fredrikson et al., 1996; Seligman, 1971) and non-human primates (e.g., Joslin et al., 1964). Fear of snakes may naturally lead to avoidance of these potentially dangerous reptiles. Avoidance reduces mortality risks and enhances the likelihood of survival and reproduction (Öhman & Mineka, 2001; DeLoache & LoBue, 2009).

Morgan and Gramann (1989) reported that increasing children's knowledge about snakes failed to improve their attitudes toward them. Prokop et al. (2009) found that students' fear of snakes negatively influenced other dimensions of attitudes towards snakes, although no student had been injured by a snake. Similarly, Tomažič (2011) found that, although pre-service teachers had a better knowledge of, and more positive scientific and moralistic attitudes, toward snakes, fear of snakes and willingness to pay for snake conservation was not statistically different in comparison to primary school students. This supports the idea that better factual knowledge is an insufficient precursor for positive attitudes toward fauna that pose a threat to humans (Prokop et al., 2009). Christoffel (2007) studied attitudes concerning venomous and non-venomous snakes and found that gender and knowledge of snakes explained much of the observed variation in attitudes toward snakes. After exposure to environmental education programs that included direct contact with snakes, participants had more knowledge and positive attitudes towards snakes than

non-participants. Prokop et al. (2009) recommended that educational activities "combine direct contact with these controversial animals with interventions against belief in untrue myths about snakes" (p. 224).

Direct contact with animals and natural environments in general changes peoples' attitudes toward several types of fauna (e.g., Bjerke et al., 2003; Barney et al., 2005; Tomažič, 2011b; Torkar et al., 2012; Wagler, 2010; Wagler & Wagler, 2011). According to Serpell (1999), contact with animals during childhood – especially pets – may shape attitudes towards animals throughout adulthood. For example, Torkar et al. (2012) found that university students from Slovenia and the Czech Republic, with more frequent concrete experiences in natural environments, expressed more positive attitudes toward pleasant animal species. Bjerke et al. (2003) found that adult pet owners in Norway liked animals more than non–pet owners, but the effect was significant only for popular animals such as dogs, cats, and squirrels. Unpopular animals, such as rats, mosquitoes, and snails, were perceived similarly by pet owners and non–pet owners. Having more pets at home is associated with less fear of snakes (Prokop et al. 2009). Ballouard et al. (2012) demonstrated that physical contact with unpopular animals reduces disgust and fear towards them. Prokop and Fančičova (2013) emphasized that effective educational programs are therefore one of the opportunities for improving children's' perception of animals.

According to the Slovenian pre-school and primary school curriculums, one of the most important contributions of studying people's relationship with nature is to show the diversity of life forms from scientific and ethical perspectives (Kurikulum za vrtce, 1999; Učni načrt: program osnovna šola: biologija, 2011; Učni načrt: program osnovna šola: naravoslovje, 2011). Among the learning goals that students should attain by the end of primary school are being able to recognize and name common animals and familiarity with their habitats. Experiences during the early years at school are important for developing students' understanding and attitudes later in life.

Wagler (2010) showed that pre-service elementary teachers' attitudes toward an animal affected their beliefs about using that animal in their future science curriculum. He found a strong correlation between pre-service elementary teachers' attitudes towards a specific animal and their likelihood to include or exclude that animal from their future science curriculum. Specifically, if teachers had a positive attitude toward Madagascar hissing cockroaches, they were more likely to believe they would use them in their future science curriculum. Conversely, if teachers had a negative attitude toward Madagascar hissing cockroaches, they were much more likely to believe they would not use that species in their future science curriculum.

The main aim of this study was to investigate the impacts that fear of snakes may have on pre-service teachers' attitudes towards conservation and the likelihood of incorporating snakes into the future science curriculum. In recent years, studies of people's attitudes toward commonly feared fauna, such as spiders and snakes, have received increasing attention among scholars (Cardak, 2009; Kaltenborn et al., 2006; Prokop & Tunnicliffe, 2008, 2010; Prokop et al., 2009; Prokop et al., 2011; Tomažič, 2011a; Torkar et al., 2012). It is known that students obtain knowledge and ideas through the help of their daily experiences related to the physical world (Vosniadou & Ioannides, 1998). Children start acquiring knowledge by organizing the multiplicity of their sensory experiences under the influence of everyday culture and language, and then narrow them into coherent explanatory frameworks (Vasniadou, 2002).

This study examined Slovenian pre-service teachers' attitudes toward snakes. Four research hypotheses were investigated:

1. Fear of snakes negatively influences conservation attitudes.
2. Fear of snakes negatively influences the likelihood of incorporating snakes into the future science curriculum.
3. Prior direct contact with snakes positively correlates with fear of snakes and conservation attitudes, and increases the likelihood of incorporating animals into the future science curriculum.
4. Direct contact with snakes affects students' word associations concerning snakes.

Methodology of the Research

General Background of Research

The research design of the study was quantitative. Slovenian pre-service teachers' fear of snakes, conservation attitudes, and the likelihood of incorporating snakes into the future science curriculum were studied using a questionnaire. The study was conducted at the University of Ljubljana's Faculty of Education in 2010, 2011, and 2012. At the beginning, the researcher orally explained the nature of the activity to the students and invited them to participate. They were given the opportunity to refuse participation.

Sample

The sample for the study was made up of 352 full-time and part-time students majoring in preschool education and primary school education. Students' ages ranged between 18 and 47 ($\bar{x}$ = 21.8; *SD* = 4.5). The sample included 13 male and 345 female students. Gender proportions in the sample reflect the situation in Slovenian schools. In the 2010/2011 school year only 1.9% of caretaker and teaching staff in Slovenian preschools were males (Statistical Yearbook, 2013). Slovenia is also one of the leading EU countries with a high proportion of women among elementary teachers, at 97.5% (Eurostat, 2013).

Instruments and Procedure

Participating students completed a questionnaire before a biology class session; this took them 15 to 20 minutes. The questionnaire was distributed by a researcher or by lecturers that were instructed on how to distribute it. Students were reassured that the questionnaire was anonymous, that it was not a test, but rather a research attempt to explore their attitudes toward snakes.

A wide range of components were included in the questionnaire. Only those relevant for the analysis are described. The first part included questions about the respondent's age, gender, and frequency of direct experience with live snakes. All of the participants were presented with the word meaning 'snake' and were asked to express themselves freely. They could write up to ten associations for the word. This form of data collection permits the investigation of the participants' ideas (Sato & James, 1999).

Fear of snakes was assessed by the Snake Questionnaire (SNAQ; Klorman et al., 1974). The SNAQ consisted of thirty true-or-false statements that were translated into Slovenian using a forward-translation and back-translation approach. The questionnaire has shown valid and reliable psychometric characteristics across several samples (e.g., Klorman et al., 1974; Soares et al., 2009). The reliability of the scales in the translated SNAQ was satisfactory (Cronbach's α = 0.88). Moreover, in several studies (e.g., Ohman et al., 2001; Soares et al. 2009) it was demonstrated that the SNAQ is an effective instrument for identifying fear of snakes.

To explore student's attitudes toward snake conservation, a questionnaire was designed by the author. Statements were similar to those used in other studies (Prokop et al. 2009; Torkar et al., 2010). Statements were scored by participants from 1 (strongly disagree) to 5 (strongly agree). In further analysis for all statements representing a negative attitude, the scores were reversed. A higher total score indicates a more positive attitude toward snake conservation. Cronbach's α for the snake conservation instrument with seven statements was 0.84. Both questionnaires show acceptable reliability (Anastasi, 1996).

Data Analysis

An analysis of variance test and Pearson's product-moment correlation were used to study the first, second, and third research hypothesis. An analysis of the associations with the stimulus word 'snake' was conducted in order to study the fourth research hypothesis. Word associations with the same meaning were coded together. Low-frequency words with the same meanings as high-frequency words were subsumed under the more frequent (general) ones. For example, 'coiled' was replaced by more the frequently mentioned 'coiling'. This is a standard approach for word association analysis (e.g., Agelidou et al., 2000; Flogaitis & Agelidou, 2003; Torkar & Bajd, 2006).

Results of the Research

Fear of Snakes and Conservation Attitudes

Percentages of true and false answers for the Snake Questionnaire are presented in Table 1. The Snake Questionnaire was used to assess students' fear of snakes by answering thirty true-or-false statements. To compute a total score for fear of snakes, each statement was assessed and given a score 0 or 1, where 1 represented a fear of snakes. A maximum score for fear of snakes was therefore 30 because there were 30 statements. For statements with an asterisk (*) false answers were considered a sign of fear (Table 1).

Table 1. Frequency table for the SNAQ questionnaire.

Statements	False (*f* %)	True (*f* %)
1. I avoid going to parks or on camping trips because there may be snakes about.	88.0	12.0
2. I would feel some anxiety holding a toy snake in my hand.	86.6	13.4
3. If a picture of a snake appears on the screen during a motion picture, I turn my head away.	86.0	14.0
4. I dislike looking at pictures of snakes in a magazine.	80.1	19.9
5. Although it may not be so, I think of snakes as slimy.	68.9	31.1
6. I enjoy watching snakes at the zoo.*	64.4	35.6
7. I am terrified by the thought of touching a harmless snake.	62.3	37.7
8. If someone says that there are snakes anywhere about, I become alert and on edge.	46.6	53.4
9. I would not go swimming at the beach if snakes had ever been reported in the area.	33.1	66.9
10. I would feel uncomfortable wearing a snakeskin belt.	27.0	73.0
11. When I see a snake, I feel tense and restless.	43.7	56.3
12. I enjoy reading articles about snakes and other reptiles.*	44.1	55.9
13. I feel sick when I see a snake.	90.2	9.8
14. Snakes are sometimes useful.*	88.1	11.9
15. I shudder when I think of snakes.	76.9	23.1
16. I don't mind being near a non-poisonous snake if there is someone there in whom I have confidence.*	80.1	19.9
17. Some snakes are very attractive to look at.*	75.8	24.2
18. I don't believe anyone could hold a snake without some fear.	69.1	30.9
19. The way snakes move is repulsive.	69.3	30.7
20. It wouldn't bother me to touch a dead snake with a long stick.*	64.9	35.1
21. If I came upon a snake in the woods I would probably run.	63.4	36.6
22. I'm more afraid of snakes than any other animal.	72.6	27.4
23. I would not want to travel "down south" or in tropical countries because of the greater prevalence of snakes.	82.1	17.9
24. I wouldn't take a course like biology if I thought I might have to dissect a snake.	69.7	30.3
25. I have no fear of non-poisonous snakes.*	57.0	43.0
26. Not only am I afraid of snakes, but worms and most reptiles make me feel anxious.	81.1	18.9
27. Snakes are very graceful animals.*	42.2	57.8
28. I think that I'm no more afraid of snakes than the average person.*	59.2	40.8
29. I would prefer not to finish a story if something about snakes was introduced into the plot.	94.7	5.3
30. Even if I was late for a very important appointment, the thought of snakes would stop me from taking a short-cut through an open field.	74.2	25.8

Descriptive statistics for conservation attitudes are presented in Table 2. Students expressed very positive attitudes towards conservation of snakes. They especially emphasize snakes' intrinsic value (statement 2), conservation of their habitats (statement 3), and the importance of maintaining snake species diversity for future generations to experience them (statement 5).

Table 2. Descriptive statistics for conservation attitudes.

Statements	Mean	SD	Min.	Max.
1. It is important to maintain all species of snakes even if I will never see them.	3.97	1.00	1	5
2. Endangered snake species, like the horned viper and adder, have a right to live in Slovenia.	4.29	0.85	1	5
3. It is important to me that we conserve natural environments where snakes live.	4.19	0.90	1	5
4. There are too many venomous snakes in Slovenia that are a threat to humans.	2.25	0.99	1	5
5. It is important to maintain all species of snakes for future generations to experience them.	4.17	0.91	1	5
6. The law should allow hunting and extermination of snake species.	1.70	0.91	1	5
7. People who deliberately kill snakes should be severely punished.	3.62	1.10	1	5
8. It is unnecessary to protect snakes in Slovenia because they also exist in other parts of Europe.	2.15	1.05	1	5

Pearson's product-moment correlation coefficient was used to examine the relation between the total score on the SNAQ and average score for conservation attitudes. Overall, there is a strong negative correlation ($r = -0.527$; $p < 0.001$; $n = 352$). The results presented in Figure 1 show that students that showed a greater fear of snakes had more negative conservation attitudes. There is a lot of variation in the fear of those with a moderate to high conservation score.

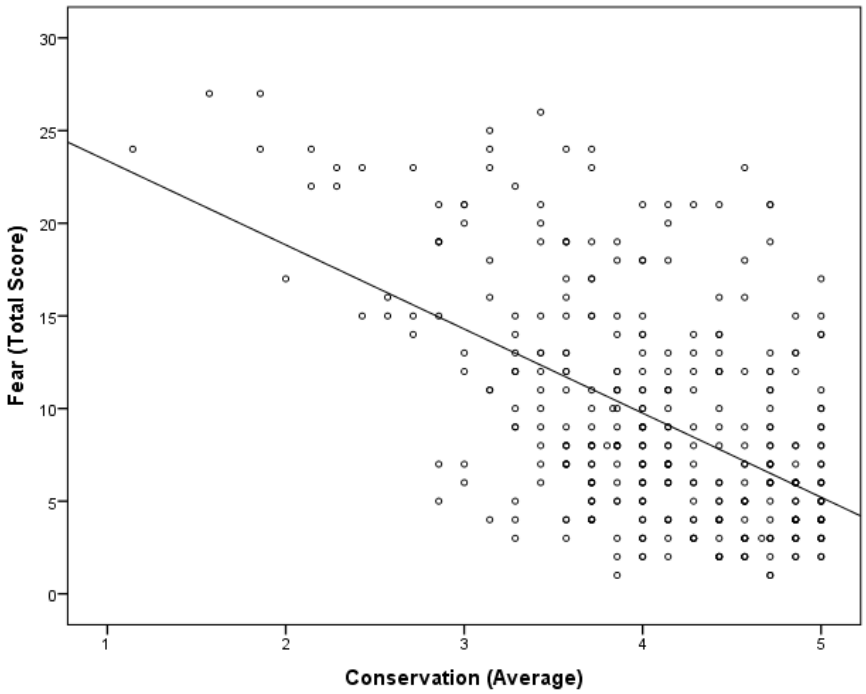

Figure 1: Relationship between fear of snakes (total score of the SNAQ) and conservation attitudes ($r = -0.527$, $p < 0.001$, $n = 352$).

Fear of Snakes and Likelihood of Incorporating Snakes into the Future Science Curriculum

The ANOVA test was used to examine the relation between the total score on the SNAQ and the likelihood of incorporating animals into the future science curriculum. The results presented in Figure 2 show that students that planned to include snake species into their future science curriculum had the lowest score on the SNAQ (median = 5), followed by students that were undecided (median = 9) and students that did not plan to include snakes in their future work as educators (median = 15). Levene's test for homogeneity of variances showed that the assumption of homogeneity of variance was violated. The Welsh test, used when homogeneity of variance is violated, showed a significant difference somewhere among the mean scores on the SNAQ test for the three groups ($p < 0.001$). The Tamhane post-hoc test showed that differences are significant among all three groups (YES / NO / DO NOT KNOW).

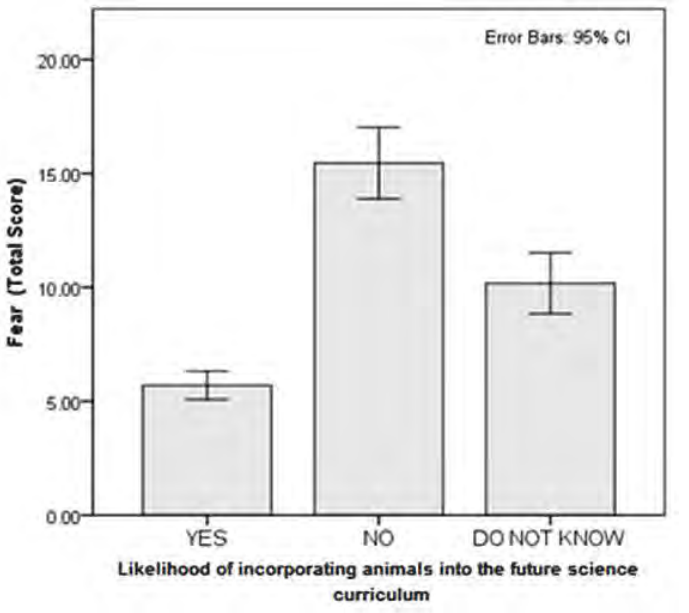

Figure 2: Relationship between fear of snakes (total score of the SNAQ test) and likelihood of incorporating snakes into the future science curriculum.

The Impact of Direct Experiences on Fear of Snakes, Conservation Attitudes, and Likelihood of Incorporating Snakes into the Future Science Curriculum

Pearson's product-moment correlation coefficient was used to examine the relationship between the number of direct contacts with snakes and total score on the SNAQ test, and between the number of direct contacts with snakes and average score for conservation attitudes. Students with a higher number of direct contacts with snakes scored lower on the SNAQ test ($r = -0.421$; $p < 0.001$; $n = 352$). A prior direct experience with snakes was associated with reduced fear of snakes. The results also confirm that a higher number of direct contacts with snakes is positively associated with attitudes that support snake conservation ($r = 0.313$; $p < 0.001$; $n = 352$).

The number of direct contacts with snakes was compared among students that planned to incorporate snakes into their future science curriculum (YES), students that did not plan to incorporate snakes (NO), and undecided (DO NOT KNOW). Students that planned to incorporate snakes into their future science curriculum had the highest median number of direct contacts with snakes (median = 3), followed by undecided (median = 2) and by students that did not plan to include snakes in their future work as educators (median = 1). Levene's test for homogeneity of variances showed that assumption of homogeneity of variance was violated ($p < 0.001$). The Welsh test showed a significant difference somewhere among the mean scores on the SNAQ test for the three groups ($p < 0.001$). The Tamhane post-hoc test showed that differences are significant among all three groups (YES / NO / DO NOT KNOW).

Direct Experiences and Associations with Snakes

Students were asked to write up to ten associations to the stimulus word 'snake'. Altogether 349 students answered the question. On average each student wrote 8.7 associations. The frequency of students' associations was calculated. Among the most frequent were associations that emphasize the potential threat posed by snakes to people, such as words meaning 'venomous' ($f = 267$), 'fear' ($f = 147$), 'dangerous' ($f = 106$) and 'snake bite' ($f = 67$). Students also highlighted certain characteristics of snakes and reptiles in general, such as 'hissing' ($f = 117$), 'cold (skin)' ($f = 115$), 'tongue' ($f = 85$) and 'mouse (as prey)' ($f = 65$).

Associations of students that already had direct contact with snakes (at least once) ($n = 298$) and those that had not ($n = 54$) were compared to test how students' direct experiences with snakes influenced their associations with snakes. All associations whose percent in their total number of different responses exceeded one percent were presented and compared between the two groups of students (Figure 3). The responses and their frequencies gave an indication of the meaning the respondents assigned to the word. The groups of students compared have very similar associations. However, students with no direct contact with snakes more frequently associate the word meaning 'snake' with words meaning 'dangerous', 'fear', 'snake bite', 'adder' and 'disgusting'. Some associations were more frequent among students with direct contact(s), such as 'scales' and 'zoo'.

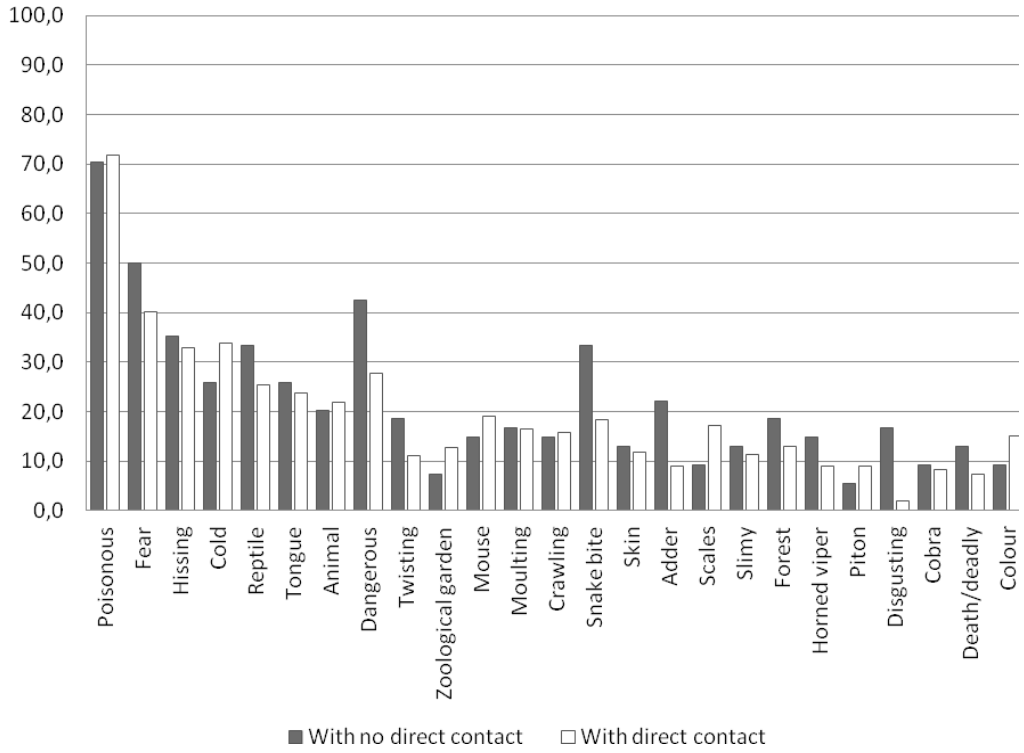

Figure 3: Associations with the stimulus word *snake*; responses by students with or with no direct contact with snakes.

Discussion

First part of the present research focused on studying attitudes toward snakes which is relevant in conservation efforts. Students expressed very positive attitudes towards conservation of snakes. Students that showed a greater fear of snakes had more negative conservation attitudes. This indicates that fear negatively influence other attitudinal dimensions (Prokop et al., 2009). Prokop and Fančičova (2013) experimentally investigated with Slovak schoolchildren and found that perceived disgust and danger of animals negatively influenced on willingness to protect them. On the contrary Ballouard et al. (2013) demonstrated that snakes are not necessary perceived as frightening animals and that many of the questioned schoolchildren from 10 countries liked snakes and wanted to

see snakes protected. Interestingly, our results show a lot of variation in the fear of those with a moderate to high conservation score. A possible explanation may be that a proportion of those fearful of snakes know that snakes play an important role in ecosystems and therefore support their conservation. They may support conservation because they take the position that each species has intrinsic value. On the contrary, if a person has no fear of snakes but also no knowledge regarding snakes, they may be indifferent towards conservation of snakes because they cannot judge whether conservation actions are the right thing to do in the case of these animals.

The relation between students' fear of snakes and the likelihood of incorporating animals into the future science curriculum was also examined. Students who planned to include snake species into their future science curriculum had the most positive attitudes towards snakes. The results are in line with the findings of Wagler (2010), who showed that students' attitudes toward cockroaches affected their beliefs about using that species in their future science curriculum. Further studies with other commonly feared animal species could show that this pattern of pre-service teachers' behavior may be true for many animals that evoke negative attitudes. If a teacher is not incorporating an animal into lessons, this may perpetuate fears in the future that could hinder students' understanding of animals and their natural environments.

According to Serpell (1999), Christoffel (2007) and Balluard et al. (2012) physical contact with animals, including unpopular animals like snakes, may shape positive attitudes towards animals. Prior direct experiences of students with snakes were associated with reduced fear of snakes. Results also show that higher number of direct contacts with snakes is positively associated with attitudes that support snake conservation.

Students most frequently associated the stimulus word 'snake' with the negative characteristics of snakes. Students showed considerable knowledge about snakes, but they rarely mention the importance of snakes in ecosystems. Direct contact with snakes was linked to a reduced frequency of some associations concerning snakes that emphasize the potential threat posed by snakes to people. Prokop et al. (2011) found that wolves, similarly like snakes, were associated with negative characteristics by children and that more they were engaged in nature related activities the less they demonstrated fear of wolves.

Conclusions and Implications

The results of the present study lead to three main conclusions. The first is that fear of snakes negatively correlated with pre-service teachers' attitudes towards conservation. Next, it negatively correlated the likelihood of incorporating snakes into the future science curriculum. Third, direct contact with snakes was associated with reduced fear of snakes, and positively correlated with pro-snake conservation attitudes and an increased likelihood of incorporating snakes into the future science curriculum. Later is particularly important because teachers influence the children's attitudes toward and familiarity with endangered species such as snakes.

The finding that positive attitudes towards snakes could be developed with direct experiences suggests that this should be encouraged in educational processes. Pre-service teachers should be encouraged to experience different animals and learn how to incorporate them effectively into teaching practice. These findings could be taken into account in the preparation of study programs for pre-service teachers, particularly those dealing with young learners.

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