Students' ideas about dangerous animals

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Contents

Abstract

The aim of this article was to study the concepts and thoughts of primary education students about dangerous animals. A total of 316 primary education students attending a primary school in Turkey participated in the study. The research data was obtained through open-ended questions and word association tests. Data obtained from the questions directed at the students were analysed one-by-one. As the students made many associations, words of the same or similar meaning were coded together. Associations encountered less than three times, and those that could not be coded with the others, were removed. Certain categories were formed according to relationships of meaning, and the usage frequency of the words in each category was calculated quantitatively. As a result of the analysis of the data, it was found that students considered the features that make animals dangerous include: being venomous, having a large size, being vicious and wild, and also

being sneaky. Furthermore, students think that vertebrate animals are more dangerous than invertebrates. They are not sufficiently aware of significantly dangerous small and harmful invertebrates that can cause death. Furthermore, it has been observed that the students have significantly insufficient knowledge and alternative concepts of animals such as snakes, scorpions, spiders and centipedes. In the light of these results, suggestions have been developed.

Keywords: Dangerous animals; primary education students; word association

Introduction

The attitude of man towards natural life and the creatures living within it has a very complex make-up. Although humane values are present in young students, ecological values become more prominent after the age of 11 (Kellert, 1996). Studies carried out in recent years have shown that students have difficulty in understanding concepts in many areas of the sciences (Bell, 1981; Driver, 1981; Bahar, 2003). Certain information described as naïve theories, preconceptions, misconceptions or alternative conceptions, developed by the students themselves and far from scientific fact, create substantial obstacles during the process of learning. According to the results of studies conducted to date, students develop these complex and mistaken notions usually during the first stages of their schooling by themselves, under the influence of family members and friends or through contradictory explanations at school (Bell, 1981; Driver, 1981; Bell & Barker, 1982; Gilbert et al. 1982). Moreover, textbooks using scientific terminology inappropriately, and containing alternative conceptions, are also significant (Coll & Treagust, 2001; Dikmenli & Cardak, 2004).

Studies of the animal kingdom and its categorization show that students have many alternative interpretations of these concepts. Bell (1981) and Braund (1991) have shown that students confuse animals with other life forms, and that their knowledge on the diversity of animals is limited by domestic animals. For example, students qualify some vertebrate animals that have no visible limbs as invertebrate, and some animals that have large exoskeletons as vertebrate. These misconceptions are seen in all students, from those attending primary education to those in university (Kellert & Westervelt, 1984; Trowbridge & Mintzes, 1985, 1988; Dikmenli et al. 2002; Bahar, 2003).

Interpretive and quantitative methodologies, in combination with open-ended questions, pre- and post-test techniques (Haslam & Treagust, 1987), concept

mapping (Novak & Gowin, 1984), drawings (Kose, 2008; Prokop & Fančovičová, 2006; Reiss & Tunnicliffe, 2001) and word association questionnaires based on keywords (Sato & James, 1999) are the principal tools used by investigators today in order to carry out the recording, categorization and interpretation of students' and teachers' ideas and conceptions.

In the resolution of information students build in their minds, word association tests are an effective tool (Bahar et al. 1999). Word association applications are often seen in other disciplines as much as in science education. Word association applications have been used by researchers since the 1960s. It has been noted in related literature (Deese, 1962; Shavelson, 1974) that word associations are a highly beneficial method in learning and teaching. Associating words is a method directly connected with the understanding of a person's concept of groups. Word associations can be used not just to check if a concept has been understood correctly, but also to understand sciences, situations and even people. The most important advantage of word association tests is the ability to prepare them in advance and present them to the students while teaching (Bahar et al. 1999; Bahar & Ozatli, 2003).

The most dangerous animals in Turkey are not ferocious mammals, such as wolves or grizzly bears, as might be assumed, but species such as venomous snakes, scorpions, centipedes, spiders and jellyfish. Animals such as bears, wolves, wildcats and coyotes try to avoid humans as much as possible. Statistically, a person killed by a ferocious animal is rarely seen, but thousands of people become ill with diseases communicated by small parasites such as mosquitoes or ticks, and, sometimes, cannot survive. The reason for the increase of these small harmful animals is the depletion of their natural enemies by mankind, and the disruption of the natural balance. In Turkey, tens of thousands of snakes are exterminated each year because they are seen as dangerous animals. In fact, of the 40 varieties of snakes in Turkey, only 10 are venomous to some degree, and they use their venom to paralyse mice and rats when they are hunting. In areas where the snake population has been depleted, there has been a population explosion among mice, and the real harm is to the cultivated fields. Wolves and bears, if the balance of their environment has not been disrupted, and as long as they are not rabid, are frightened of people and will stay away (Turkiye Direyi, 2008). The tick bites first seen in Turkey in 2002, and the associated Crimean-Congo Haemorrhagic Fever (CCHF) are increasing yearly and causing deaths (Ataturk University, 2009).

In this article, the answers to the following questions were sought:
1- Which animal do primary students think is most dangerous?
2- What animal do primary students think of when they think of dangerous animals?
3- What do primary students think is the most important feature that makes animals dangerous?
4- What are the word associations for snake, scorpion, centipede and spider?

The purpose of the research

The purpose is to investigate which animals primary education students consider the most dangerous and what feature makes an animal dangerous. Furthermore, the study aims to investigate which associations arise when students hear the names of dangerous animals such as snake, scorpion, centipede and spider. In addition to these purposes, some alternative conceptions of the students have also been emphasized.

Materials and Methods

Subjects

This research was conducted among 316 primary education students attending a primary education school in Turkey during April and May 2009. Primary education students were chosen randomly. The ages of the students in the sampling of the research varied between 10, the youngest, and 15, the oldest. The average age was around 13.

Instruments

The students participating in the study were asked to fill out a questionnaire consisting of open-ended questions and word associations. The questionnaire was written in Turkish, and was later translated into English for this manuscript. The participating students were asked, "Which is the most dangerous animal in your opinion?"; "When dangerous animals are mentioned, which animals do you think of?"; "What is the characteristic that makes an animal dangerous?"; and "What associations do you think of when you hear the words snake, scorpion, centipede and spider?" The questionnaires were given to the students during science and technology classes, and they were given 30 minutes to answer the questions freely.

This data collection method allows for the observation of the thoughts of the participants (Sato & James, 1999).

Data analysis

Data obtained from the questions directed at the students was analysed individually. As there were many associations, words of the same or similar meaning were coded together. Words used less often, but meaning the same as frequently used words, as well as frequently used general words, were separated into subgroups. Associations encountered less than three times, and those that could not be coded with the others, were removed. The words were categorized according to meaningful relationship criteria (Sato & James, 1999; Flogaitis & Agelidou, 2003; Torkar & Bajd, 2006) and the usage frequency of the words in each category was calculated quantitatively. Separate lists of the answers to the open-ended questions were created. In the first of the open-ended questions, the most dangerous animals (11 animals) were listed with their frequencies. In the second question, dangerous animals (15 animals) were listed with their frequencies. In the third question, the feature that makes these dangerous animals dangerous was given in categories (two categories). In the fourth section, the associations given for the words snake, scorpion, centipede and spider were categorized into different quantities according to the word (snake: 4; scorpion: 5; centipede: 4; spider: 4).

Results and Discussion

The answers given by the students are shown in following tables. Data obtained from students' answers was grouped by most dangerous animal, list of dangerous animals, dangerous animal features and the frequency of the associations to four of these dangerous animals: snake, scorpion, centipede and spider.

a. Most dangerous animal according to students

From the answers given to the question of which is the most dangerous animal, the names of 16 animals were listed. However, as the frequencies of five answers (dinosaur, hen with chicks, elephant, frog, and rhinoceros) were less than three, they were included under the others category. The list and frequency of the remaining 11 animals are given in Table I. While 304 of the 316 students in the

sampling gave associations for the most dangerous animal, 12 didn't answer. In the answers given by the students for the most dangerous animal question, snake ranks first with 144 answers. Snakes are not as dangerous as it is believed (Atatur & Gocmen, 2001; Oluk, 2009).

Table I: *Most dangerous animal according to the students*

Name of animal	Frequency
Snake	144
Scorpion	36
Lion	30
Spider	18
Centipede	17
Alligator	13
Bear	11
Insect	9
Dog	9
Tick	8
Wolf	4
Other	5
No answer	12

b. Dangerous animals according to the students

When the students were asked to list the dangerous animals they could think of, two different categories, 19 different animal names and a total of 1152 associations were listed from the answers. It was seen that the dominant category was vertebrates. While there were a total of 709 vertebrates, there were only 443 invertebrates. Less than three associations were not listed separately, but were listed under 'Other' in Table II. Fifteen students did not answer. It is interesting to note that there were not many associations with ticks, which have caused fatal diseases in Turkey in recent years. In fact, many people are losing their lives due to tick bites every day (Ataturk University, 2009).

Table II: *Dangerous animal associations according to the students*

Category	Name of animal	Frequency
Vertebrates	Snake	292

	Lion	176
	Bear	67
	Wolf	48
	Dog	34
	Elephant	30
	Tiger	26
	Rhinoceros	24
	Coyote	5
	Other	7
Total		709
Invertebrates	Scorpion	183
	Centipede	97
	Spider	89
	Tick	33
	Insect	26
	Jellyfish	11
	Other	4
Total		443
No answer		15

c. Features that make animals dangerous according to the students

When the students were asked for associations with what the feature was that made animals dangerous, two different categories were formed: physical properties and classification; and emotional and behavioural properties. A total of 1327 associations were given. In these categories, 17 word associations were found. With 780 associations, the physical properties and classification category was the dominant category. The highest frequency in the students' associations was venom, with 272 associations. The students held the belief that venom was the most important feature that made an animal dangerous. Furthermore, the associations of the students to a large body size and strength were also significant. When the emotional and behavioural properties category is considered, the most noticeable association was aggressive properties, with 156 associations, while associations with rending and sneakiness were also considerable. Seventeen students did not answer this question (Table III).

Table III: *Feature associations that make animals dangerous according to the students*

Category	Students' associations and frequencies	Total frequency of words in the category
Physical properties and classification (10 words)	Venom (272), large body (154), strength (94), pincers (90), tail (61), cutting teeth (54), claws (34), tongue (8), reptile (8), head (5)	780
Emotional and behavioural properties (7 words)	Aggressiveness (156), rending and savage (138), sneakiness (103), fast and sudden movement (97), hissing (38), repugnant and cold appearance (10), camouflage (5)	547
Total 17 words		
No answer		17

Evidence obtained from this study creates a basis for identifying the complexity of associations, opinions and primary concepts relating to endangered bird species and their protection. Evidence from our study is similar to the results of Torkar and Bajd (2006). Such complex associations definitely must be taken into account, especially while organizing protection activities and creating educational strategies by which a larger amount of people are targeted in order to protect endangered bird species and habitats. Legal arrangements and controls relating to hunting should be enforced more strictly in Turkey. Taking into account ovulating times and maturity time of babies while hunting and paying required attention to avoid exceeding limits during these hunting periods will contribute to the prevention of the extinction of these bird species.

d. Associations with the word snake

A total of four categories - danger; physical properties and classification; environment; and emotional and behavioural properties were formed when the students were asked for associations to the word snake. A total of 24 words were observed in these categories. In the analysis of the answers given by the students, there were 1279 associations. Although the highest number of associations was with the term dangerous, when categories were considered, the category of emotional and behavioural properties was dominant. Emphasis was on the biting and stinging of snakes in the emotional and behavioural properties category. Eleven students did not answer this question (Table IV). Although actually very few of the snakes (about 10 species) found in Turkey are venomous or harmful to humans,

they were considered dangerous and fatal. This result is concordant with Oluk's findings (2009). Furthermore, Atatur and Gocmen (2001) have claimed that 30% of snakes are killed on the assumption that they are dangerous to humans. Evidence that may be considered as an alternative conception by the students is that some of them believe that the snake's tongue has a stinging property. The students were not aware that the tongue of the snake does not have carry venom. This result supported our belief that the students had alternative conceptions (Bell, 1981; Trowbridge & Mintzes, 1985, 1988; Dikmenli et al. 2002).

Table IV: *Associations with the word 'snake'*

Category	**Students' associations and frequency**	**Total frequency of words in the category**
Danger (1 word)	Dangerous and fatal (191)	191
Physical properties and classification (9 words)	Venom (171), reptile (67), length (52), eye (42), changing colour (18), teeth (18), tongue (17), slippery body (10), cobra (4)	399
Environment (5 words)	Forest (75), house roof (74), underground (30), long grass (16), summer season (9)	204
Emotional and behavioural properties (9 words)	Biting and stinging people (140), cold and repulsive (87), frightening and scary (85), enemy (60), panic and excitement (48), sneakiness (29), fast movement (19), sound (11), swallowing (6)	485
Total 24 words		
No answer		11

e. Associations with the word scorpion

When the students were asked for associations to the word scorpion, a total of five categories were formed: danger; physical properties and classification; environment; emotional and behavioural properties; and the zodiac sign of Scorpio. A total of 30 words appeared in these categories. The analysis of the data obtained from the students disclosed 1100 associations. Although the association with the highest frequency was the word dangerous, when the categories were considered, the category of physical properties and classification was dominant. In the physical properties and classification category, the most frequent response was the stinging

of scorpions with 112 associations. An interesting association was the sign of scorpio, with 18 responses. Sixteen students did not answer this question (Table V). An alternative conception here was the presence of students who thought that a scorpion was a reptile when, in fact, it is an invertebrate. It was apparent that the mode of locomotion of an animal was a key factor for the students in classifying animals (Braund, 1991; Chen et al. 1994; Kattmann, 2001; Prokop et al. 2007)

Table V: *Associations with the word 'scorpion'*

Category	**Students' associations and frequency**	**Total frequency of words in the category**
Danger (1 word)	Dangerous and fatal (183)	183
Physical properties and classification (13 words)	Venom (165), tail (85), sting (54), feet and legs (39), pincers (36), small (28), eye (21), large (18), head (16), body segment (11), reptile (10), animal (6), Colour (4)	493
Environment (6 words)	Village houses (21), forest (15), under stones (10), house ruins (8), summer season (5), earth (3)	62
Emotional and behavioural properties (9 words)	Stinging people (112), frightening and scary (102), aggressive and savage (45), sneakiness (35), excitement and anxiety (14), pain inflicting (12), cold and repulsive (12), suicide (7), fast movement (5)	344
Zodiac (1 word)	Sign of Scorpio (18)	18
Total 30 words		
No answer		16

f. Associations with the word centipede

When the students were asked for the associations to the word centipede, four categories were formed: danger; physical properties and classification; environment; and emotional and behavioural properties. A total of 23 words were observed in these categories. In the analysis of the answers given by the students, there were 917 associations. The largest number of associations was in the physical properties and classification category, with 502 associations. In this category, the word feet, with 156 associations, was at the top of the list. 42 of the students didn't answer

this question (Table VI). Again, an alternative conception detected among the students was that they placed centipede in the reptile category, with 96 associations. An interesting piece of evidence gleaned from the students was that the centipede was considered harmless and cute. The number of students considering the centipede dangerous was quite low with 47 associations. The reason that students think of the centipede as harmless or slightly dangerous may be associated with the fact that they see it as a small and cute creature.

Table VI: *Associations with the word 'centipede'*

Category	Students' associations and frequency	Total frequency of words in the category
Danger (1 word)	Dangerous (47)	47
Physical properties and classification (12 words)	Too many feet (156), reptile (96), long (84), small (35), venomous (30), non-venomous (24), insect (20), segmented body (19), small (19), animal (8), eye (7), colour (4)	502
Environment (4 words)	Under stones (76), earth (45), summer season (32), forest and trees (14)	167
Emotional and behavioural properties (6 words)	Repulsive (70), stings people (41), harmless (40), pretty and cute (22), fast movement (21), pain (7)	201
Total 23 words		
No answer		42

g. Associations with the word spider

When the students were asked for associations with the word spider, five categories, namely: danger; physical properties and classification; environment; emotional and behavioural properties; and movies, were formed. There were a total of 26 words in these categories. The analysis of the data obtained from the students' answers disclosed 1615 associations. The most frequent associations were with the word dangerous, with 186 associations. The physical properties and classification category was dominant with 795 associations. In this category, web was at the top, with 180 associations. In this category, there was also non-venomous, with a significantly high number of 94 associations. Eighteen students did not answer this question (Table VII). Again, an alternative conception observed in the students was their classification of the spider as a reptile. An interesting piece of data obtained from the students was the fact that many saw the spider as a harmless and

peace-loving animal. Most of the students considered the spider repulsive and terrible. Students are afraid of animals they are not constantly in association and do not constantly encounter in daily life (Davey, 1992, 1994; Kellert, 1993).

Table VII: *Associations with the word 'spider'*

Category	**Students' associations and frequency**	**Total frequency of words in the category**
Danger (1 word)	Dangerous and fatal (186)	186
Physical properties and classification (12 words)	Web (180), venomous (153), non-venomous (94), too many legs (85), large (80), small (71), furry (60), eyes (29), colour (18), various species (17), animal (5), reptile (3)	795
Environment (4 words)	Old houses (151), walls (63), summer season (14), forest (7)	235
Emotional and behavioural properties (8 words)	Repulsive (89), terrible (54), fast movement (48), love and peace (40), stinging people (31), harmless (27), excitement (10), loneliness (3)	302
Movie (1 word)	Spiderman movie (97)	97
Total 26 words		
No answers		18

If information, particularly about dangerous animals, is gleaned from hearsay resources with no scientific basis, it causes serious problems in later educational stages. The place and importance of the environment in the student's cognitive development is great, and when the child cannot reach the sources of correct information, s/he develops alternative conceptions. This issue must be given sufficient importance in educational programmes and textbooks. It must be explained to people, especially those who are involved in agriculture and who live in close contact with nature for certain stages of their lives, that, in order to protect the ecological balance, no creature should be killed by humans. When it is considered that mankind is the most harmful of all creatures, the greatest duties also lie upon humans.

Conclusions

This study has investigated the conceptions and some alternative conceptions of primary students, between the ages of 10 and 15, on dangerous animals and the features that make these animals dangerous. As a result of the analysis of the obtained data, important results were discovered. The students included in the sample think that the features that make an animal dangerous generally include being venomous, having a large body, being rending and savage, and being sneaky. The students think that vertebrates are more dangerous than invertebrates. They are not fully aware of the small and harmful invertebrates that cause significant deaths on a more frequent basis. Students also have a significant amount of insufficient information and alternative conceptions about animals such as snakes, scorpions, spiders and centipedes.

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