

Appendix A

Interview scheme for primary teacher educators in science education

Introduction

Introducing (background interviewer: Master Science Education & Communication at Utrecht University)
Telling short about the research study: in task of Netherlands Institute for Curriculum Development (SLO). The concept-context approach is central. An elaboration for primary education is not yet present. It is questioned how concepts of the CVBO can be selected. It is not known and therefore it should be looked at. Curious to your ideas about this issue.

Is there permission of the interviewee to record the interview? The interview data will be processed anonymously.
Duration of interview: up to one hour.

Questions

1. Content

- a) What does the concept animal mean to you?
- b) Which content about the concept animal do you discuss with students? Which underlying concepts are discussed?
- c) How do you determine the content? Which choices do you make? Are you using guidelines? Which guidelines?
- d) Which other considerations do you take into account? Which come first and why?
- e) What is the emphasis on the concept animal for primary education, according to you? Why?
- f) What is your ideal for content about the concept animal for primary education? Why?
- g) Would you like to make an order of 5 concepts which you consider as important for the concept animal?
Why did you choose these concepts?
- h) Are the 5 concepts of the order present in your lessons? Or do you offer a selection? Which selection?
- i) How are these concepts appear in your lessons?

Remark: When an answer is given about didactics, ask more questions about how it is reflected in the concept animal.

2. Making an order of CVBO concepts

- 22 concepts (without animal) of the CVBO for primary education are shown on cards. Also, blank cards are present on which other concepts can be written, when needed.

- a) Would you like to make an order of 5 concepts of the presented 22 CVBO concepts which are, according to you, essential to the concept animal in primary education?

- Why do you choose these concepts?
- Why is the concept ... at the top?
- On what grounds you made your choice?

- b) Would you like to make another order of 5 concepts of the presented 22 CVBO concepts which are, according to you, essential to the concept animal for children in the age of 4 to 8 years? (*see follow-up questions 2a*)

- c) Would you like to make another order of 5 concepts of the presented 22 CVBO concepts which are, according to you, essential to the concept animal for children in the age of 9 to 12 years? (*see follow-up questions 2a*)

- d) Could you explain why the orders for younger and older children are different (or are similar)?

Conclusion

Do you have any questions or remarks?

May I contact you when I would like to know more about your answers?

When the interview is transcribed and summarized, I will sent it back to you for a member check.

In the end, a research paper will be written of which a copy will be sent to you.

Thank you.



Questionnaire study about the concept animal in primary education

The CVBO developed a curricular strand with concepts for primary education¹. This study is focused on a further elaboration of the conceptual framework for biology education in primary education. The aim is to investigate how a substantive elaboration of the concept animal can be worked out. This concept is one of the concepts of the conceptual framework. This questionnaire contributes to this.

The completion time of the questionnaire is approximately 15 minutes. The data will be treated confidentially and serve only the research study.

Would you like to send the completed questionnaire back by e-mail to A.Lammers@uu.nl before **the 14th of March 2012**?

Thank you for your cooperation.

The questions are on the next pages

Background

1. What is your sex? *Underline your answer.* Male / Female
2. What is your age? *Write your answer in the open space beneath the question*
3. What is your education?
4. Where do you work?
5. How many years are you working in your present working field?

¹ Boersma, K. Th., Graft, M. van, Harteveld, A., Hullu, E. de, Knecht-van Eekelen, A. de, Mazereeuw, M., Oever, L. van den, & Zande, P. A. M. van der (2007). Leerlijn biologie van 4 tot 18 jaar vanuit de concept-contextbenadering [A learning line for biology for 4 to 18 based on the concept-context approach]. Utrecht: CVBO. See: <http://oud.nibi.nl/nibidvd/CVBO-teksten/CVBO%20Biologie%20leerlijn%204-18.pdf>

Questions

Write your answer in the open space beneath the question.

6a) What do you think students in primary education should learn about animals?

6b) Why do you think that? When you mentioned multiple topics/aspects in question 6a give an explanation for each mentioned topic/aspect.

7a) Give an order of 5 concepts you consider as important for the concept animal in primary education. Write the concepts in the left column of the table below.

Order	Explanation
1.	
2.	
3.	
4.	
5.	

7b) Why did you choose these concepts? Give an explanation in the right column beside the chosen concepts.

The commission CVBO has determined 23 biological concepts for primary education. These are presented in the table below. The concept animal is removed.

Concepts CVBO		
Organ	Life cycle	Ecosystem
Respiration	Health	Food chain
Digestion	Behaviour	Biosphere
Blood circulation	Reproduction	Sustainable development
Sense	Heredity	Biodiversity
Plant	Fossil	Interaction with (a)biotic factors
Human	Form and function	
Nutrition	Species	

8a) Give an order of 5 concepts from the 22 CVBO concepts you consider as indispensable for the concept animal in primary science education for children in the age of 4 to 8 years. Write the concepts in the left column of the table below.

Order children age 4-8	Explanation
1.	
2.	
3.	
4.	
5.	

8b) Why did you choose these concepts? Give an explanation in the right column beside the chosen concepts.

9a) Give an order of 5 concepts from the 22 CVBO concepts you consider as indispensable for the concept animal in primary science education for children in the age of 9 to 12 years. *Write the concepts in the left column of the table below.*

Order children age 9-12	Explanation
1.	
2.	
3.	
4.	
5.	

9b) Why did you choose these concepts? *Give an explanation in the right column beside the chosen concepts.*

10a) Give an order of 5 concepts from the 22 CVBO concepts you consider as indispensable for the concept animal in primary science education (all ages). *Write the concepts in the left column of the table below. NB. This question was not analyzed, because it was often a reflection of the other two orders.*

Order primary school students all ages	Explanation
1.	
2.	
3.	
4.	
5.	

10b) Why did you choose these concepts? *Give an explanation in the right column beside the chosen concepts.*

Thank you for filling in the questionnaire.

Send the completed questionnaire to A.Lammers@uu.nl before **the 14th of March 2012**

Appendix C

Photographs used in interviews and group discussions with primary school students. Each photograph represents one of the everyday life contexts in which animals play a role.

Excursion/holiday



Examining nature



Family



School



Health care



Shop



Appendix D

Interview scheme primary school students

Duration interview: approximately 15 minutes

1. Showing photographs.

The children are asked to choose one of the 6 photographs about animals that is appealing to them. *The children are asked first to have a look at it and then pick a photograph.*

The photographs which are presented:

- A museum with a skeleton of a sperm whale (everyday life context excursion/holiday). The activity of examining is reflecting in the context. Motivation for this photograph: from own experience: it amazes children.
- Walking a dog (everyday life context: family). The activity taking care is reflecting. Motivation for this photograph: it is recognizable for children.
- A cat examined by a veterinarian (everyday life context: health care). The activity of treating is reflecting. Motivation for this photograph: a veterinarian clinic belongs to this context.
- A mole hill (everyday life context: examining nature). The activity of examining is reflecting. Motivation: a trigger for children (what is beneath?).
- An aquarium (everyday life context: school). The activity of taking care is reflecting. Motivation: it is recognizable, an aquarium is present at the school.
- Collecting eggs (everyday life context: shop). The activity of buying is reflecting. Motivation: it is recognizable, product is derived from animals.

2. Questions (from the specific context)

1. What do you see? Do you recognize it?
2. Why did you choose this photograph?
3. Do you like it?

Dependant of chosen photograph follow-up questions:

4. (museum) Did you ever see such a thing? Do you know what it is?
5. (walking a dog) Do you have (a) pet(s) at home? What do you think of your pet(s)? What do you have to do when taking care of a pet? Why?
6. (veterinarian) Did you attend a veterinarian with an animal? What was going on with the animal?
7. (mole hill) What do you think it is? Did you see it before? Where?
8. (aquarium) How do you take care of fish? What do you need?
9. (collecting eggs) Do you eat sometimes an egg? Where does the egg come from? Do you know other food products of animal origin?
10. Do you encounter animals somewhere else not depicted on the photographs?
11. What would you like to learn at school about animals?

Appendix E

Analysis science education methods. The 23 concepts of the CVBO are indicated in grey. The concepts found in the methods are black, concepts for kindergarten are underlined, concepts for children aged 8 to 9 years are normal and concepts for children of age 11 to 12 years are in italics. Concepts that appear twice is due to the fact that the particular concept is present in material for multiple grades.

NatuNiek

	System concepts				
Organisation level	Biological unit	Self regulation and self organisation	Interaction	Reproduction	Evolution
Molecule					
Cell					
Organ system	Organ	Respiration Blood circulation Digestion	Sense Senses Pupils Echo Smell Senses of touch		
Organism	Plant Animal Carnivore, herbivore, omnivore Human	Nutrition Nutrition Life cycle Health	Behaviour Interaction with (a)biotic factors	Reproduction <i>To reproduce</i> Heredity	Fossil <i>Fossil</i> Form and function Teeth (carnivore, herbivore and omnivore)
Population	Species				
Ecosystem	Ecosystem <i>Natural equilibrium</i> <i>Environment</i> <i>Coral reef</i> <i>Primeval forest</i> <i>Territory</i> <i>Habitat</i> <i>Food supply</i>	Food chain Food chain Cycle Prey Predator <i>Food chain</i>			
Biosphere	Biosphere <i>Climate</i> <i>Climate change</i>	Sustainable development <i>Overhunting</i>			Biodiversity <i>Fauna</i> <i>Become extinct</i>

Leefwereld

System concepts					
Organisation level	Biological unit	Self regulation and self organization	Interaction	Reproduction	Evolution
Molecule					
Cell					
Organ system	Organ Skin (protection)	Respiration Gills Blood circulation Digestion Decomposing (of animal)	Sense Echo (bat)		
Organism	Plant Animal <u>Appearance</u> <u>Rabbits, frogs, birds</u> Insect Appearance Bat Spider Feathers Frog, toad Soil animals <i>Insect</i> <i>Skeleton</i> <i>Vertebrates</i> <i>Spinal column</i> <i>Body plan</i> <i>Mollusc</i> <i>Shell</i> Human	Nutrition <i>Bio industry</i> Life cycle <u>Eggs</u> Peel Development frog & toad Frogspawn, tadpoles Egg strings <i>Moult</i> Health <i>Animal testing</i>	Behaviour <u>Way of life</u> Way of life spider (building a web) Way of life toad, frog (migration of toads) Way of life bat (Hibernation) <i>Migration birds</i> <i>Instinct</i> <i>Way of life goose</i> <i>Behaviour</i> <i>Animal sounds</i> <i>Sign language</i> <i>Courtship</i> <i>Smell language</i> <i>Instinct</i> <i>Way of life wasp, ant, bee</i> (wasps' nest, anthill, beehive) <i>Live together</i> <i>Winter and summer migrants</i> Interaction with (a) biotic factors <i>Interaction with biotic factor (insects pollinate plants)</i>	Reproduction <u>Bird's nest</u> Heredity	Fossil Form and function Form function (long paws of frog) <i>Form function (bird beaks and feeding)</i>

Population	Species Species (frog)				
Ecosystem	Ecosystem <u>Habitat</u>	Food chain Decomposers Soil animals			
Biosphere	Biosphere	Sustainable development			Biodiversity <i>Endangered species</i>

Natuurlijk

System concepts					
Organisation level	Biological unit	Self regulation and self organization	Interaction	Reproduction	Evolution
Molecule					
Cell					
Organ system	Organ	Respiration <i>Breathing in water</i> <i>Gills</i> <i>Gill lamellae</i> Blood circulation Digestion <i>Metabolism</i> <i>Body temperature, feathers, hairs (isolation, touch, protection), isolation, winter fur, Adaptation to hypothermia (water birds), fat layer (seal)</i>	Sense Sense See Colour Nectar guides (for insect) Sound Auricle Odour Touch		
Organism	Plant Animal Appearance Insect (earwig, wood louse, lady bird, ground beetle) (gnat, fly, green fly) Rostrum Common swift, stickleback, earthworm, toad, hedgehog <i>Diurnal, nocturnal and crepuscular</i> <i>Water animals</i> <i>Size, streamlined body, web footed</i> <i>Bees, red deer, lynx, seal, gnat</i> Soil animals Pets Human	Nutrition Nutrition Nectar, grass Energy (for movement) Food of animals origin <i>Food supply</i> Life cycle Births, young, old Dead/alive Lifespan <i>Life cycle (gnat) pupate, metamorphose, reproduce (adult)</i> Molt <i>First phase of life</i> Egg <i>Pouch, belly (marsupials, mammals)</i> Dying	Behaviour Hibernation (hedgehog) Moving Searching food Way of life (common swift, stickleback, earthworm) Nesting Breeding care Protection Nidicolous and nidifugous birds <i>Breeding care</i> Protection Egg strings (toad) Hibernate Hibernation Migration Biorhythm	Reproduction <i>Sexually mature</i> <i>Fertilization</i> <i>Internal</i> <i>External</i> <i>Sperm cell, egg cell, fusion</i> <i>Gestation period</i> Reproduction (bees) <i>Nuptial flight</i> Heredity Breeding	Fossil Form and function Form function (tongue frog, eyes and ears rabbit and fox)

		<i>Natural enemies, disease, traffic, aging</i> Health Healthy Sick	<i>Movement (of water animals)</i> <i>Living and working together</i> <i>Colony (bees)</i> <i>Mating (red deer)</i> <i>Fighting, roaring, hierarchy</i> <i>Winter and summer migrant</i> <i>Go wild</i> Interaction with (a)biotic factors 'Milking' (ant with lous) <i>Pollination (insects)</i> <i>Helping each other (raising juveniles)</i>		
Population	Species				
Ecosystem	Ecosystem Habitat Badger sett Habitat Barriers Distribution Living environment (atmosphere, water, soil) Living space Territory Pecking distance Zoo	Food chain Predator Prey Eating and being eaten Hunt Prey (eggs, juveniles) Food chain Cycle of minerals, gasses Soil animals Food web Prey Scavengers Carrion			
Biosphere	Biosphere	Sustainable development			Biodiversity Novice Become extinct Release animals (lynx) Fish, amphibians, reptile, birds, mammals