



Can Teaching on Ticks Increase Learning about Body and Health?

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Abstract

An important part of the biology subject matter in school is the biological processes in the human body and health. In the Swedish curriculum these are present in all years of the compulsory school. Anyhow, students do not have an overall understanding of health and bodily functions. The misunderstandings of the nutritional processes of the human body have been reported by several authors. We have been teaching physiology to preservice teacher and biology students for several years trying to reach a better understanding of processes in the human body. The present study shows teaching of health and body starting with a discussion about ticks and the various diseases they spread in the Stockholm area. Nine preservice teacher students participated in four weeks of biology studies, including ecological processes and organisms' life cycles. The last week was devoted to body and health. The idea was to begin with the circulatory system as students often focus on the various functions of the organ but forget to link it to the blood system. By connecting to the students' previous knowledge of organisms and ecosystems to body and health, we started with an introduction of ticks by going out collecting and investigating their morphology and life cycle and continued with a video clip showing how the virus and bacteria are spread through the blood. The following lessons contained function of body systems, nutrition and the immune system. After this the students wrote reflections from three different lessons about their learning and what was surprising. They also wrote a lesson plan for teaching body and health in primary school (year 4-6). At the end of the course, the students had an examination in three parts where one was concentrated on body and health. Results from the reflections and the written exam showed that the students understood the interaction between the different parts of the body better and the importance of the circulatory system, but also between different organisms and how they may affect each other. The inclusion of ticks in the course increased the understanding.

Keywords: *Biology teaching, body function, circulatory system.*

1. Introduction

One part of the biology subject matter in school is the biological processes in the human body and health such as the circulatory system, digestion, respiratory system, how to cure diseases, infection and the importance of nutrients and sleep for the future life. In the Swedish curriculum for compulsory school, one of the overall goals is that "each pupil should have obtained knowledge about and an understanding of the importance of the individual's own lifestyle and its impact on health [...]". This is achieved by learning about the importance of sleep, social relations, exercise and food as well as the name and functions of the parts of the human body in primary school. At the end of the compulsory school the knowledge is focused on how mental and physical health are affected and the mechanisms of cells, organs and organ systems and their interactions [1]. Despite learning about health and how the body works throughout all school years, students do not have overall understanding of health and bodily function and what causes diseases. Several reports have shown students misunderstanding of digestion [2, 3], blood circulation [4] and the purpose and function of gas exchange in lungs [4, 5]. We have also experienced that students try to recall the name of the organs but do not know how they interact with each other. When discussing digestion, the knowledge often stops after the uptake of nutrients in the intestine.

Therefore, we have been interested to develop biology courses for preservice teachers and biology students with a holistic view of organs and their function in the studies of health and bodily functions [6]. In order to further improve the understanding of the interactions between different organ systems and their function from a macroscopic view down to microscopic view at the cellular level and illness the course started with a discussion about ticks which may transfer pathogenic bacteria and virus to humans.

2. Course description

Nine preservice teacher students completed a four weeks course of biology containing ecological processes, different organism life cycles and, at the end, health and physiology. The teaching was



arranged by inquires and discussions in groups supervised by the teacher. To link bodily function and health to organisms and their life cycles previous taught, the students were capturing ticks and studied their morphology and discussed their life cycle. The students were also supposed to answer questions about two illnesses ticks may cause; Borrelia and Tick-borne encephalitis (TBE). The teaching continued with questions and discussions about antibiotic, bacteria, virus, vaccine and the defence system. To visualize the action by ticks, the teacher showed a short video clip showing how ticks infect a human with bacteria that enter the blood and the circulatory system spreading the bacteria through the whole body. This gave the introduction to questions about the functioning of the blood and circulatory systems and later digestion, lung and respiratory system and the extraction of energy from nutrients.

After the sessions of health and bodily function, students wrote reflections on the lessons answering questions about what they learned and what surprised them. The task was also to write a lesson plan for body and health in primary school (year 4-6). In the lesson plan they should include an area of the subject, how they would perform the teaching and why they chose the subject to teach. The course finished with a written examination including all parts of the course, where one part was concentrated on body and health.

3. Methods

The reflections were analysed by qualitative methods identifying and describing the learning processes and which themes the students regarded as important.

4. Results

The qualitative analysis showed that 2/3 of the students were describing the cooperation between the different organs and how they are connected to each other as an important issue. Some students mentioned that it is more important to have a holistic view than to know the name of the individual organs. Most of them also discussed the important of the circulatory and respiratory systems. What was very obvious is that starting to discuss how Borrelia and TBE are spread in the body gave the knowledge about the blood circulation and how it affects the whole body – in all of the cells. The students where correctly referring to the different processes in the body showing a holistic view (Table 1).

The part in the written examination about body and health consisted of three questions:

- 1) Describe and explain how blood circulation interacts with the lungs during gas exchange. Why is breathing important for body functions?
- 2) Describe what a vaccine is and explain how it can prevent diseases. Why is vaccine used against virus more often than against bacteria?
- 3) Describe the digestion overall and explain why it is important to eat.

Five students answered with elaborate explanations of all questions and received the highest mark. Only two students out of nine did not pass. This was a better result than last year when six out of 15 students failed. The better result from the examination could be due to many factors and it is difficult to draw any strong conclusions, but it may be an indication of a better teaching strategy. More studies have to be done to compare different teaching strategies.



Health	Organ system	Cell function
It is important to have the knowledge about illness and how to keep us healthy.	I learned that the gut melts the food with the help of enzymes and that it is when it has become small enough that it can be absorbed through the intestinal wall, that it really is in the body.	To see similarities and differences between an animal cell and a plant cell.
When I was studying ticks and how they infect, for the first time I understood the difference between virus and bacteria.	I learned the importance of seeing the whole as I talk about and study the various functions of the body. Without the whole I have a hard time understanding and remembering because there are many parts to remember, if you focus on the whole and learn the connection, this can act as a tool for understanding.	All life on earth is reminiscent of one another. Plants and animals have cells, although they differ slightly. All life on earth needs energy, our primary source of energy is the sun. Everything living on earth belongs together and shares energy and nutrition.
I learned that ticks as vectors for Borrelia and TBE are not only bad but necessary for the ecosystem.	I think it is important to emphasize how important the role of the lung is to the blood and that all the organs of the body work together.	I got a deeper explanation of photosynthesis which I had no previous knowledge of.

Table 1. Examples of students' reflections on what they learned.

5. Discussion

It is important for the teacher to create learning situations which start from the students' own experiences in order to improve knowledge in science. The student should not only understand and talk about the world but also experience and connect to their own everyday life [7]. In this study, learning about health and body function started with discussion about ticks and the various diseases they spread in the Stockholm area. It is important that after being in the field, to check for ticks on the bodies of the participants. The chance to get infected of TBE has increased in the area and health authorities encourages people to vaccinate. The approach was to teach the section on health, diseases and bodily functions through students' own experience of ticks linked to previous studies of ecological systems and life cycles for different organisms. By doing this, the students gained a context where they could continue to investigate the functions of the body organs and how they work together as well to understand the role of oxygen in energy recovery.

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