Teaching science abstract concepts at the primary level

Science abstract concept, like a gene or DNA, is somewhat difficult to teach, particularly for young students. DNA, or Deoxyribo Nucleic Acid, is the hereditary material in humans and almost all other organisms. Nearly every cell in a person's body has the same DNA. Most DNA is located in the nucleus (where it is called nuclear DNA), but a small amount of DNA can also be found in the mitochondria (where it is called mitochondrial DNA or mtDNA).

"What is DNA?" is a question that some of primary student might ask. And the first paragraph might be the answer of primary teachers. Though the answer is correct, it is still difficult for primary students to grasp the idea. For that reason, it is crucial to research an approach to the teaching of the concept of DNA at the primary level by reflecting some aspects of the learning perspectives. This paper reviews an article presented by Donovan and Venville whose research is based on what so called a *constructive view of learning science*. Next, there is an explanation how teachers' awareness is critical in terms of cultural contexts in learning science.

Before I discuss teaching DNA at the primary level, I would like to examine about some learning perspectives. Two learning perspectives which I observe in the paper are behaviorism and constructivism. Behaviorist learning perspectives are focused on stimulus-response outcomes. It emphasizes the outward behavioral aspects of thought and dismisses the inward experiential and sometimes the inner procedural aspects as well. Constructivist learning perspectives affirm the mind constructs its own reality. Humans can understand only what they have themselves constructed. It emphasizes the building or constructing that occurs in people's mind when they learn. By reflecting on his experiences, one constructs his own understanding of the world he lives in. So, I believe it makes sense to talk about a *constructivist view of learning*, and we might ask about the teaching which *affected* from such a view of learning. Personally, I am very interested in the teaching which might result from a teacher's commitment to a constructivist view of learning.

Yet, I suppose, teachers should be aware of the pitfall of regarding constructivism as the only viable theoretical framework for teaching and learning. As I mentioned previously, it is one way of thinking about how knowledge and understanding are formed, but it is not the only way. Teachers should be able to expose varying perspectives and give themselves opportunities to choose and develop the most appropriate perspective and possess the skills to implement their choices.

What is it that teachers think they are doing when they set out to teach science in the classroom? If they want Year 2 pupils to know about DNA, what is wrong with a straightforward, abstract, presentation about DNA? One of the answers is that this teaching seems to place less influence on creating contexts for science, and more on presenting science as a formal body of knowledge. This teaching is a formal offering which does not pay any attention to contexts in which DNA might be valued.

Donovan and Venville used simple wool model with the Year 2 students to represent DNA. Models are powerful tools not only of the scientific description of the world *out there*, but of student's cognition of things, especially things that are not directly accessible to the sense. Concrete models are objects which belong to the world accessible to student's direct experience. Furthermore, they related what students had about DNA and genes to their theories of inheritance and biology.

The social environment of the classroom is good at throwing up constraints which challenge individual perceptions. Pupils often have different views of a situation. If these views seem incompatible, there is a need for reconciliation which can lead to the social mediation of individual knowledge. In Donovan and Venville's research, there were valuable discussions occurring with students describing the forms of DNA. Through discussion or argument, the pupils negotiate new positions which lead to shared meanings developing. Such negotiation is not bargaining, but a genuine offering of individual perspectives and meanings for consideration by others.

In this case, what seems crucial is the making of meaning. In order to consider meaning-making for pupils, both individually and collectively, teachers have to recognize its dependence on individual experience and socio-cultural practices. When Donovan and Venville used pictures of dogs, they were less aware in terms of what is prohibited in Islam since they work in Islamic Primary School. All human behavior must be understood relationally, in relation to its society, culture, and contexts. Social interactions and children's participation in authentic cultural activities are necessary for understanding children's learning.

Consequently, a constructivist approach to science teaching and socio-cultural practices in science classroom are integrated into a wider community of practice in which social actions are identified and classroom activities are designed. Thus, the interaction of children in classroom activities is a small part of their enculturation into the required social actions. To derive culturally relevant and socially just practice, it is urgent for teachers to deconstruct and scrutinize cultural assumptions that underlie various interpretations of concept of DNA.

The awareness of cultural context completes the discussion about an approach to the teaching of the abstract concept of DNA at the primary level. Knowledge of behaviorist, cognitive, and constructivist learning theories should be emphasized by teachers to design, justify, and execute an approach to their teaching. As a result, teachers are able to deliver the most appropriate solutions for a variety of learners and learning situation. Model, especially physical model, is the tool of scientific thinking. It is one of the means to apprehend and comprehend reality beyond the threshold of direct perception. Learning took place through the differential strengthening of bonds between situations and actions. From this perspective, it is a natural step in an attempt to understand how social and cultural conditions shape children's activities and therefore affect the way they learn, not only on individual students' understandings of specific phenomena, but also on how these understandings are developed in the cultural context of the science classroom.