CHILDREN'S CONCEPTUAL FRAMEWORK ABOUT NATURAL PHENOMENA AND ITS IMPLICATION FOR SCIENCE TEACHING

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By appreciating, amongst other things, the perceptions that the learner brings to the class, the teacher can reduce the discrepancies between pupil's intentions and his learning. Similarity of constructed meaning to that intended by the teacher depends on the way a pupil copes with the language used by the teacher during instruction.

During the last two decades there has been a major upsurge in interest in science education. Children's informal ideas particularly about the natural and physical environment have drawn attention of many science educators. The ideas which they bring with them to the science class have great implication in science teaching. Recent studies by psychologists and science educators have indicated that children have views about a variety of topics in science from young age even when they have not received any systematic instruction in those subjects whatsoever. These ideas and interpretations are a result of everyday experience—of practical, physical activities and of talking with other people. Their views are often different from the views of the scientists and are frequently not well known by teachers. To children, they are often sensible and useful views.

Young children, like scientists, are curious about the world around them in how and why things behave as they do. As children attempt to make sense of the world in which they live in terms of experiences, their current knowledge and use of language, they develop ideas which may be called 'children's science'. Although their ideas are less sophisticated than those of practising scientists, some interesting parallels can be drawn. Children, like scientists, view the world through the spectacles of their own pre-conceptions and many have difficulty in making their journey from their own intuitions to the ideas presented in science lessons. They do come to the science class with already formulated ideas or alternative frameworks and these may be at variance with the theories the teacher wishes to develop. However, these intuitive ideas have a powerful influence on subsequent learning.

When children in a class write about the same experiment they can give various diverse interpretations of it. Individuals internalise this experience in a way which is at least partially their own; they construct their own meanings. These personal ideas influence the manner in which information is acquired. This personal manner of approaching phenomena is also found in the way scientific knowledge is generated. The observations children make about natural phenomena and interpretations of them are also

influenced by their ideas and expectations. Same ideas may be shared by many pupils about similar events or same child may have different conceptions of a particular type of phenomenon. Thus a child's individual ideas may seem incoherent. It is important in teaching and curriculum development to consider and understand children's own ideas, their conceptual framework about natural phenomena as it is to give a clear presentation of the conventional scientific theories.

By the time children come to school, their expectations or beliefs about natural phenomena are well developed. These intuitions may be poorly articulated but they provide a base on which formal learning can be built. However, in some cases the accepted theory may be counter intuitive with children's own beliefs and expectations differing in significant ways from those to be taught. Such beliefs are referred to as 'alternative frameworks' by Driver (1983). There is evidence from a number of investigations that children have common alternative frameworks in a range of areas, including physical phenomena, such as propagation of light, simple electric circuits, ideas about force and motion and chemical change as also biological ideas concerned with growth and adaptation. To cite an example from plant nutrition it is very often heard that pupils believe in plants taking prepared food from the soil. As regards respiration in plants, children have the notion that plants respire only at night and during day time they only photosynthesise.

It is often noticed that even after being taught, children do not modify their ideas in spite of attempts by a teacher to challenge them by offering counter evidence. Children either ignore counter evidence or interpret it in terms of their prior ideas. What children are capable of learning depends, at least in part, on what they have in their heads as well as the learning content which is presented to them. Learning does not occur by the learner responding in a passive way to the environment but by actively interacting with it. It takes place through the interaction between a learner's experience and the conceptual framework he has to give meaning to such experiences.

Pupils as individuals inevitably construct their own purpose for a lesson, from their own intentions regarding the activities they will undertake, draw their own conclusions and carry these through in their subsequent thinking. The fundamental premise is that children tend to generate perceptions and meanings that are consistent with their prior learning. These perceptions and meanings are something additional both to the stimuli and the learner's existing knowledge. When a teacher talks to his class, draws a diagram on the blackboard, discusses a chart or asks pupils to read a textbook, his intended meaning or that of the textbook author is not automatically transferred to the mind of the pupil. Each child in the classroom constructs his or her own meaning from the variety of stimuli present in his or her environment. To construct meaning, it requires effort on the part of the learner; links must be generated between stimuli and stored information. Teachers must contrive learning situations in such a way that mental constructions made by pupils—what the lesson is about, what is to be done or what can be and what is to be learnt from it correspond with their own intentions. By appreciating, amongst other things, the perceptions that the learner brings to the class, the teacher can reduce the discrepancies between

pupil's intentions and his learning. Similarity of constructed meaning to that intended by the teacher depends on the way a pupil copes with the language used by the teacher during instruction.

From an educational perspective it has been argued that it may be necessary to take account of the ideas and beliefs that young pupil bring to their formal study of science if these ideas are to be successfully modified by instruction. The intuitive ideas that students hold prior to instruction are both identifiable and stable and have enough commonality to make it worth planning instructional sequences to change them. The implication of it is that the strategy to be used in any given institutional situation should depend on whether or not children already have many such ideas.

If we adopt a view of learning as conceptual change in its broadest sense then we need to have information about the ideas that students may bring to the learning situation. When students are presented with ideas in science lessons they may fit them into their intuitive ideas and the result may be a mix of taught science and intuitive science. At other times, a student may compartmentalise his or her knowledge and not integrate new knowledge with existing knowledge. When they meet formal science lessons in the school, students have to actively modify and restructure their own ideas. This requires a willingness and effort on the part of the learner. Likewise, if the ideas held by students are to be taken into account, teaching cannot simply be viewed as the telling or giving of knowledge to the students. Teaching involves helping each student to construct for himself or herself the accepted ideas. The starting point of a teaching sequence is then the intuitive ideas students bring with them, the conceptual framework they have with them. Having found out the ideas held by students in a class, the role of the teacher then becomes that of diagnostician and prescriber of the appropriate learning activities. Teaching needs to be related to what is familiar to the children not just at the level of the world of events and experiences but also in their world of ideas.

If a science lesson is related to the world outside the classroom in a way which helps the pupil expand his or her knowledge of that world and to make sense of it in a new way, if it is related to prior ideas that the child has already stored in memory, he or she is able to fit the lesson into the pattern of his/her existing ideas and experience. So to make a lesson interesting it must have relevance to children's everyday life. To be aware of children's existing informal ideas about natural phenomena is important if we are to help them relate these ideas in their minds to the learning experiences provided for constructing new ideas.

References

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