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HOW DO CHILDREN'S IDEAS IN SCIENCE AFFECT SCIENCE TEACHING?

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What are children's ideas in Science?

A child, after birth, is constantly using his five senses to interact with the environment, including human beings and materials. He learns through such interaction and gradually establishes his own ideas about natural phenomena. This will form his basic arguments/reasonings in explaining what happens to people and things. Such intuitive ideas can be easily discovered as children give their opinions about what is observed or what will happen. The following episodes will illustrate what we mean.

Episode 1:

A dialogue between two brothers on the explanation of bird droppings.

Min Xin: (Age 5+)	Small brother, you see. I have already told father to try to avoid parking the car under the tree. But he is so stubborn. Now, you see that the windscreen is dirtied by the birds.
Zhi You: (Age 3+)	Big brother, yes. I can see the dirt. But, why do the birds behave in such way?
Min Xin:	Oh! It is because birds don't have toilets to go. Not like human beings, they don't know how to build it, because they don't have hands. Usually, birds are free to fly any-

where they like in the sky since higher up there are no traffic lights. If they feel tired, they will take a rest on the tree. Occasionally, they have stomach-ache and they can stand no further. Then they just let go. As a consequence, they dirty the cars. Understand !

Zhi You: Yes. It is too bad.

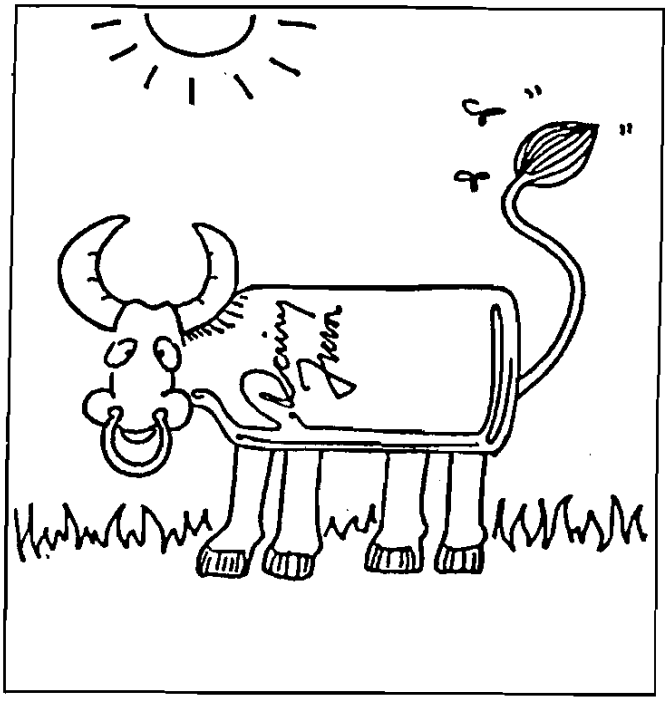
Min Xin: Not really. They have no other way.

Episode 2:

This is an essay written on the subject of a beast (cow) by a child of ten. The child's vision heads the introduction to The Milky Way, a history of Dairy Farm, Hong Kong's first milk producers who celebrate their centenary in 1986.

ESSENCE OF COW

The cow is a mammal. It has six sides – right, left an upper and below. At the back it has a tail on which hangs a brush. With this it sends the flies away so that they do not fall into the milk. The head is for the purpose of growing horns and so that the mouth can be somewhere. The horns are to butt with, and the mouth is to moo with. Under the cow hangs the milk. It is arranged for milking. When people milk, the milk comes and there is never an end to the supply. How the cow does it I have not yet realised, but it makes more and more . . . The cow does not eat much, but what it eats, it eats twice, so that it gets enough. When it is hungry it moos, and when it says nothing it is because its inside is all full up with grass.



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The "dialogue between the two brothers" and the "essence of cow" presented above could lead to the following observations:

- Before entering school, children have already equipped themselves with their own 'process skills'. They have already developed their own perceptions about science. In school their intuitive ideas might or might not go hand in hand with scientific concepts taught by teachers. As a result, this creates problems in the acquisition of some scientific concepts.

- Children's way of thinking arises from physical experience, which is usually at the macroscopic (concrete) level. Such thinking can be affected by their peers easily.

- Children's reasoning ability depends on their own logical system and their verbal ability. The analogous model has frequently been used as a mean to explain what happens. The relating of human characteristics to

the behaviour of animal natures, or that of certain animal characteristics to the behaviour of non-living objects, is also very obvious. Usually, children confuse inference with observation. They often jump into conclusions without taking the condition(s) into consideration. Here, the experiential gestalt of causation is commonly applied by them to predict and explain the changes.

From these observations, what then are the implications for science teaching?

Implications for science teaching

1. In the classroom practice, the teacher should not expect that what she plans and teaches will be easily received by students. A teacher-centred approach is definitely not appropriate and effective for science learning, especially for the young students. Students may not easily be convinced and hence they fail to accept certain scientific concepts.

2. For conceptual changes, the intervention can take place only if a student is made aware of certain conceptual conflict between his previous conception and the one taught in class. Hence, the learning activity/activities should be designed to take this into account.

3. To enable students to benefit from conceptual conflict, the teacher should help them to articulate openly their preconceptions. Furthermore, opportunity and encouragement should be given to students to express and examine their ways of thinking.

4. Taking the cognitive development of children into account, students' scientific concepts should be formed stepwise. Hence a spiral curriculum might be appropriate for such progress. If the materials and activities can be so selected such that it matches well with the students' level, then the students will find no difficulty in recognizing the conflict.

Conclusion

The 'jug' theory of education is no longer valid. We now know that children are already equipped with certain ideas in science before they are formally taught science in the classroom. As a result, it makes the teaching of science more challenging. A science teacher should not only be aware of the existence of such ideas, she should also find out what such ideas are and how to take them into account. Science activities should be organised in such a way that students' ideas are challenged. In order to influence students' thinking more effectively, encouragement should be given to them, so that they can express themselves in a non-threatening atmosphere. Besides this, discussion between teacher and students, as well as among students themselves, can definitely contribute.