ATTACK! 56

THROUGH THE HOLISTIC CURRICULUM

NETWORKONNET for an holistic curriculum and a responsive education system

Kelvin Smythe Editor: Allan Alach

Welcome to **ATTACK!** a two-page occasional publication. Most of **ATTACK!** will be concerned with the holistic curriculum which, if acted on, is a fundamental way to undermine the present undemocratic education system. Don't be discouraged if opportunities to teach holistically are limited, do your best, be a guardian, and act as a witness to this culturally significant and inspiring way of teaching and learning. **ATTACK!** is a partner to https://networkonnet.wordpress.com

Attack! 56 Developing a case for the earliest learning of science and, of course, music, art, drama, and all the rest Part 2

Mark Cosgrove is a New Zealand teacher-educator and was Head of the School of Teacher Education, University of Technology, Sydney.

HERE IS A BIG IDEA

The process of learning, of developing a personal view of reality, is a selection process in the brain. Those neuronal pathways that are regularly used are selected and strengthened. In contrast, the pathways that are under-used are eliminated, as are those which are not used at all. So severe is this elimination that by the time the brain is adult, over half of its connections have been eliminated. And the circuits that do remain are strengthened by being in use. You become what you are not because of what is added but because of what neuronal circuits are removed. In this way, the brain's structure, and what we learn, is adapted to our environment, physical and cultural.

Learning by eliminating neuronal circuits in the brain is a strange idea. Think about this as a selection process.

If children are to develop a sophisticated reality then the outside world must provide what the brain needs. If this does not happen the child is restricted and underdeveloped. We know this from studies of children in deprived circumstances; such cases provide further support for this view, that our reality is developed from our experiences. For example, young children locked up in orphanages such as those incarcerated in Romania during Ceaușescu's despotic reign and later adopted, struggle to reach even a low standard of learning. But if they were adopted before becoming two years old they had a fair chance of normal brain development. Sadly, older adoptees usually failed to attain even basic levels of cognitive capability.

So far, then, the infant's brain is active consciously and unconsciously developing its own view of reality. It cannot do this well if there are gaps in its observations and experiences.

The process of making sense of the world, of developing a sense of reality, is driven by children in the course of their daily lives. Children use diverse inputs such as observing events, listening and thinking about things thereby producing their own realities. The outcomes of this private learning are often strongly adhered to and may be resistant to change.

The existence of these private realities was the principal finding of two major studies, the *Learning in Science Project*, LISP (1978-81) and the *Learning in Science Primary Project*, LISP (1982-84) at the University of Waikato.

These projects involved children whose ages were from five years to fifteen years, now named y. 1 - 10.

The researchers, having mapped out the realities of many children in that age range set out to find ways that teachers could present enriched opportunities for learning science which recognised that learners have the capability to generate ideas and to refine them.

In the LISP (y. 1 - 6), a teaching model, Interactive Science, was produced to help teachers to focus on learners building stories about, say, flames and fires by observations first, and then, to propose explanations for those observations by interactions with their peers, teachers and the wider culture.

In the LISP (y. 7 - 10) study, the teaching model was based on the idea of refining children's views by critically examining the views held by peers on a topic in order to find more powerful stories, and sometimes to generate a consensus, a new view for some.

These projects were aware that learners had much prior knowledge about the topics and that the implications of this meant that there would be strong allegiance to children's own ideas and that alternatives might not be all that welcome. If there was a clash of ideas there could be a number of outcomes: the clash might not be resolved so that learners have two versions of reality, their own and the teachers'. Or, this conflict may lead to hybrids: combining parts of several theories to make new ones.

Extending children's explanations

In the course of any investigation, certain ideas and questions arise that convince teachers and researchers that there is a variety of explanations. These are called mini-theories, or children's science, and even alternative frameworks.

Many learners show strong allegiance to their own mini-theories even if the value of a mini-theory is quite restricted. This existence of mini-theory or idea can be a problem for teachers; for if teachers ignore them, children may accommodate the classroom information in a separate part of the brain from their mini-theories. Or they try to splice information from their lessons on to a valued mini-theory, resulting in a confused and often unacceptable new mini-theory. Dissatisfaction is a likely outcome. And confusion.

Here is an example. It happened in Sydney a few years ago where a new road tunnel was being built under the harbour near the bridge. An 11-year-old was watching from a distance of about 400 metres as a truck dumped a load of boulders from the drilling into a barge. The child saw the boulders disappear into the barge and he noticed that the sound of the boulders hitting the bottom of the barge came a little later: he saw the event before he heard it. Unfazed he commented, 'That must be a deep boat.'

That explanation is easily tested by having a close look at the barge. If it is deep, then the child's explanation is supported. If not, he would have to think about it. What would his teacher do next? The mini-theory here is 'sound is instantaneous; it does not take any time to go from the barge to the boy's ear.' Thinking about echoes might help.

Our culture's philosophy is built around the axiom known as 'cause and effect.' This means that events have causes; things do not change without something making them change. Science education has the propensity to develop this axiom into an over-arching concept. The boy clearly understands cause and effect.

What is science? An answer often put forward is that 'science is what scientists do'. This by itself is not particularly helpful until we see what they do. And why.

Let's ask two eminent scientists how they think about science. First, Richard Feynmann, a Nobel Prize winning physicist. (ref: 'The Fabulous Mr Feynmann' YouTube). He states 'Science is in the business of making sense of the world. It works by people generating ideas, examining these ideas critically and then testing the ideas by experimenting. If the experiment does not support the idea then that idea is rejected. In other words, science works by disproving ideas. It does not and cannot prove anything is true.' If an idea fails an experimental test, or if it cannot be tested, it is not science.

In other words, scientists generate ideas, test these ideas and if successful they are added to the body of knowledge, for the time being.

Next, Peter Medawar, Nobel winner in medicine puts some flesh on Feynmann's somewhat skeletal model. Medawar (*Pluto's Republic*) describes four types of tests or experiments. The first is where the researcher asks, 'I wonder what would happen if …' The second is, 'Let's see what happens when we take a different view…' Third, 'Is it this option or is it that one?' The fourth set is where an experiment is used to show a particular event or effect, that is, a demonstration experiment.

Continued in Part 3