How to make Science Interesting for Children

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Before one can talk about making science interesting for children, there are some basic questions that need to be asked and answered - ‘How can science not be interesting?’ and ‘Why is school science boring?’

To answer the first question, science can be defined as the observation of the universe through the senses and with instruments that extend the scope of the senses. After this, we build models on how the universe works. Given this definition, it is hard to see how science cannot be interesting! It is the joyous exploration that all babies and toddlers do as they crawl around, watch things, pick them up, throw them, taste them and learn from their observations. One baby I know has just learnt that not everything bounces! Year by year, this learning is extended to make correlations and abstractions.

As regards the answer to the second question, without going into a questioning of the whole education system itself (though the answer finally does depend on that), we need to ask, “What are we trying to teach when we teach science through textbooks?” Firstly, there is confusion between science and technology. Secondly, there is confusion about what constitutes scientific literacy, i.e. is science ‘process’ or ‘content’? Thirdly, in our textbooks, we have dumped simpler content for more ‘advanced’ content, which has no grounding in what the children know. For example, the 10th standard SSLC textbook had the rocket equation and talked about rockets and satellites without having covered Newton's laws of motion or logarithms in mathematics.

Teaching science as a process, through which students learn content, will take away much of the difficulty that students face in learning this subject; that it bears no relation to the world they know and the difficulty of memorizing facts in isolation. There are excellent science textbooks and programmes, which follow the exploratory method. Eklavya’s programme, Homi Bhabha Science Centre’s Small Science Series of books (refer Pg. 62 for a review of these books), and NCERT’s primary science texts, are a few examples. These have not been widely adopted in schools, in my opinion, because of one failing - they do not lend themselves to easy evaluation. It is very difficult to set tests for what students have learnt in an exploratory way; there are no facts that can be reproduced. The failing I mentioned is not of the books but of the system of evaluation itself. There can be no radical change in the way we teach and learn unless there is a radical change in the way we evaluate teaching and learning, and that is an exploration in itself.

Very narrowly, let us say that science in the classroom should have an experimental approach for it to be meaningful and interesting to students. There are many reasons why a science teacher may feel apprehensive about adopting an experimental approach to the teaching of science. Experiments are expensive, disruptive in the classroom, potentially dangerous and take up too much time. However, the fact is that much of school science is actually experimental in nature and acquiring knowledge is easier through such an approach. It makes more sense to show that sodium is a silvery white metal that reacts violently with water, than to read out the statement. The dramatic demonstration also makes the fact easier to remember. More importantly, when we teach school science through experiments, the students learn several important skills. They learn the skill of working with their hands, observation and data collection. At a deeper level, they learn that thinking about a process and bringing it fruition can be two very different things. This will help them gain a realistic perception of (and respect for) people who work with their hands for a living. They learn not to take any statement merely at its face value. ‘How’ and ‘Why’ are questions that will immediately come to their minds.

After talking in generalities, what can a teacher, having a large class and being bound to textbooks, do? We can bring in science as a process in many ways:

First, we can connect the material to everyday experience. This works very well for the primary and secondary levels. The standard V textbook in Karnataka has a lesson on levers, where levers and the various classes of levers are defined, in terms of effort, load and fulcrum. The teacher can give examples of levers, let the students find out what levers do, and ask them to observe and come back with examples of the use of levers in everyday life. These will range from crowbars to bottle openers to chakkis, and a lively discussion will follow.
Second, we can make connections by narrating the story of the discovery - Who found out, When, What experiments were done, What did the discovery mean? I teach the structure of the atom this way. The outline would include Dalton's model of the atom and the assumptions he made, flame tests by Bunsen and Kirchhoff, Mendeleev's periodic arrangement based on properties, the discovery of radioactivity (a great source of stories and personalities), the discovery of the electron, Thomson's model of the atom, Rutherford's experiments and his model based on them, and Bohr's model linking it to the flame tests. This gives an overview of how the present model came about and therefore makes it easier to visualize, remember and apply. It takes me about six periods to tell this story. The flame tests are done as actual experiments.

The third is to do demonstrations. This would be done for experiments that could be hazardous, or use expensive materials, or to keep a linear flow of discussion. I would do the flame tests discussed above as a demonstration, may be calling on the students to hold the salts in the flame.

The fourth is to do simple experiments, with easily available materials, on a micro scale, using, for example, ink droppers and plastic sheets, so that it can be done by students, at their desks. [See Box 2]

The fifth is to use an experimental analogy. [See Box 1]
Any science lesson will use a combination of the above methods. This approach puts a lot of onus on the teacher. S/he will have to constantly ponder on questions like, “How can I illustrate this concept?”, “Which simple experiment will work?”, “What is a good example from daily life?”, etc. In fact, I am still looking for a simple experiment to demonstrate Boyle’s law quantitatively!

Good sources for experiments and for the design of simple equipment are, the internet, college textbooks, popular science books, UNICEF handbook for science teaching and most important of all, oneself. It is a lot of hard work to make science fun, but is deeply rewarding and will add to one’s enjoyment of the classes. A word of caution though - Try out the them in the classroom, since, at times, they may not work as expected. Many books show an experiment to demonstrate that air has weight. It involves balancing two filled balloons tied to the ends of a ruler. Deflate one and the end with the filled balloon will dip (the books say), since the filled balloon is heavier. In fact, because of buoyancy, the filled balloon goes up!

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