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A Feelings Approach to Science Teaching

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Science is commonly perceived as being a collection of facts and procedures. However, it is this perception that many children react to while learning it which can lead to an aversion for the subject that is rather unfortunate. In this article, I will discuss the approach to science teaching adopted in the school I teach where an attempt is made to create a suitable atmosphere in the classroom that is beneficial to both the teacher and pupil.

The basic skills that science attempts to inculcate are data collection, depiction of this data in suitable forms like tables and graphs, simple analysis and writing a suitable report. Other skills include the ability to make deductions or predictions, to see mathematical relationships in the collected data, to construct working models and so on. Now, to ensure that children engage in perfecting these skills in a science class, it is necessary to get them interested in some topic. That is possibly where the challenge of managing the class begins. For them to take interest in something requires a sufficient degree of emotional connection, both with the teacher concerned and with the topic itself. This is clearly influenced by factors ranging from physiological issues (like tiredness, aches and pains, etc.) to various kinds of pleasant and unpleasant emotional distractions. In what follows, some issues that I encounter in my classroom are discussed. The examples given are mostly gleaned from physics and chemistry since these are the subjects I am most comfortable with.

One source of stress and distraction that happens in a science class occurs while children are learning to work with units. Children above 12 years of age are

familiar with algebra where quantities such as x , y , a , b (which are abstractions of numbers and are either variables or constants depending on the context) are manipulated and used to solve equations. Now, in the description of physical phenomena, students learn about quantities such as mass, time, length and so on which are measured in terms of units such as the kilogram (kg), second (s) and meter (m). These units are also algebraic in nature in the sense that 10kg is actually 10 multiplied by kg and 19.3m/s is 19.3 multiplied by m and divided by s. Further manipulation of such units is carried out using the usual rules of algebra. However, units are not abstractions of numbers in the way x , y , a , b are since in any given math problem these quantities are meant to be equal to actual numbers. In a science problem however, we cannot set kg or m equal to any number. They are actually algebraic names that follow algebraic rules and so are abstractions of the sort dealt with in branches of higher mathematics like group theory. If this is not frequently clarified, I find that many children find it difficult to automatically associate complex combinations of units with complex phenomena like, for example, force with kgm/s^2 or pressure with kg/ms^2 . Frequently students mistake one quantity for another. Consider this statement, where a student describes the change in acceleration as a ball is tossed up. “The acceleration decreases as the ball rises till it reaches zero when the velocity is zero and the ball is at its highest position”. Clearly, velocity and acceleration have been regarded as the same thing. It is much harder to see acceleration than it is to recognise velocity. Familiarity and teacher pressure might make students use units blindly but

generally a niggling uncertainty as to its meaning can persist which tends to promote avoidance at an early stage itself and of course later too.

Another frequently encountered issue is the unwanted display of emotions and feelings. Whenever focussed attention is demanded of a group of students, distractions of all sorts that undermine learning can arise. These distractions can take the form of students talking among themselves, teasing, both subtle and open, of one's fellow students or the teacher, physical restlessness or resigned passivity. For the class teacher, clearly, a highlighting of this sort of behaviour in a way that encourages indulgence has to be avoided. The usual solution which involves the use of fear of punishment and other punitive measures is a quick way of dealing with such problems. But this does not solve the long term objective of learning since most students generally switch off especially when such measures are applied regularly. So, is there any other way of dealing with it?

One interesting observation about a child (till possibly the age of 18 or so) is that any particular feeling usually lasts for a short time before changing over to some other feeling. For example, when trying to learn about different kinds of indicators for testing acids and bases, the colour changes can be very engaging for a while but can change to boredom once the novelty wears off. This could then change to curiosity if a general principle about the concentration of H^+ ions is mentioned which can possibly lead to a need to want to do an experiment rather than using the intellect. Taking measurements might be a possible response. But after some time, the children may completely lose interest and may only be interested in chatting in a general way. And so on and on it goes throughout the class. In such an ever changing scenario, the important thing to be noted is that, if significant communication cannot happen during the time when interest is shown by the children, it is not likely to be a very productive class. This is in marked contrast to an adult, where he/she is capable

of supporting an interest for longer time periods with greater focus. Adults are also capable of learning under varied emotional conditions unlike children who have limited capacities in this regard.

One of the ways we adopt in school to deal with this issue of inattention is for the teacher to start with being clear about what he/she wants in a manner that can be articulated in specific implementable steps i.e. implementable by the students in the class. Though students have feelings that change relatively rapidly, the teacher can decide what he/she wants to support. Such directed action does tend to minimise the time that students spend in unnecessary activities. Inappropriate thoughts and feelings cannot be wished away but their expression in students can certainly be modified to more acceptable behaviour. If a student has, say, begun teasing other students, a short walk outside class may be prescribed or another activity can be suggested. What generally works is usually a demand that can be fulfilled easily by the student. Another technique that helps is to be able to set goals that are simple to achieve. For instance, if students are doing problems in a topic they find difficult to comprehend like, say, the law of moments, one can demand focussed attention till about five to ten problems are done well in some prescribed manner. Such clear demands and small goals can give a sense of achievement that goes a long way in ensuring that communication links are strengthened and errant behaviour be discouraged without pointedly lecturing on the topic. In one 9th standard class, students were asked to carry out the lever law experiment after designing and making suitable mass holders out of wire. Though simple, difficulties do arise if one wishes to make a good holder (for example, a holder which can be moved easily across the meter ruler and yet not slip when loaded). Their initial efforts had frustrating moments which were accompanied by complaints and a general dip in interest. But when they were told to pay more attention to what they were doing they finally did come up with some good

workable products. If their fledgling efforts had not been supported continually, they might well have given up or not made an effort to bridge the gap between thought and product.

Finally, I would like to make some remarks regarding some kinds of demands that could be made on children which are not comprehensible by them. For example, asking for focussed attention till a law is understood or to ask that an innovative idea or solution come about in a specified time period are demands chil-

dren cannot emotionally empathise with. It is easy to see why since, logically, not even a teacher or any other adult can fulfil the above demands in a finite time since the act of learning and understanding is not exactly procedural. However, such demands may be made on adults since their brain processes can and do produce results that are satisfactory. But asking students to fulfil such demands can, over time, lead to emotional distress and disruptive behaviour that may prove difficult to correct.



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