'Dinosaur Syndrome' of science education and its impact on budding scientists

Indian science is not doing well and academicians, understandably perturbed about it, are trying to analyse its root cause. This is amply reflected in the spate of articles concerning this matter published in various issues of *Current Science* in 1999 and also by discussions of the Science Summit held at Bangalore during 7–8 August 1999. Another interrelated issue of serious concern is that bright students are no longer opting for science. A number of reasons have been put forward to account for this decline and for the poor condition of Indian science today. These include – lack of career opportunities after completion of Ph D at the late age of 27–28 years, lack of material comforts and social recognition comparable to that in the field of civil services, lack of top-class research facilities, indifference of the bureaucracy to science, delays in getting funds, etc. All these have undoubtedly contributed in varying degrees to the decline of Indian science. However a very significant basic aspect which has been largely ignored till now is the lopsided approach in science education which begins at the primary level in the school and continues till the post-graduate level. This includes 'information bombardment' and lack of an educational environment which could inculcate a spirit of enquiry. The objectives of the evaluation system appear to be production of robots who are good in memorizing scientific facts.

With the occurrence of 'information explosion' in science in the last two decades, there has been a frantic haste to load as much information as possible in minimum time into the young minds. As a result, science curricula at each of the various levels of education have assumed dinosaur dimensions, hence the term 'Dinosaur Syndrome' which I have coined for this malady. Consequently, young minds are not able to assimilate, understand and appreciate science. In the process of remembering a huge amount and a wide diversity of scientific facts, youngsters do not develop the habit of thinking, enquiring and analysing. The lack of originality and innovation in research which we lament about is the end product of this lopsided science education which emphasizes remembering and not thinking and inquiring.

This intense information bombardment is deadening the inherent scientific temper which children are born with. At present, youngsters have no time to think and to wonder about the myriad fascinating facts of science and no time to play and enjoy their childhood. Senior students get hardly any time to read books other than those which are prescribed. Reading a wide variety of books stimulates the thinking process and contributes to a balanced development of the personality.

A teacher enjoys teaching because of the thrill and the pleasure he or she gets on finding about something new and fascinating and is able to see this wonder being reflected in the students' faces. A teacher must get sufficient time to communicate the excitement of scientific knowledge and new discoveries. The aim of teaching should be to trigger a desire in the students to explore, innovate and understand further. The idea should be to inculcate problem-solving skills and to relate science to their everyday life by devising simple thought-provoking, open-ended experiments wherever necessary.

The emphasis in science teaching must shift, to an appreciable degree, from simple book learning to laboratory and to field-based practicals, involving exploratory activities with an element of enquiry. For instance, most school and also college students are not aware of the names and habits of the various types of common insects and birds in their own locality. Madhav Gadgil's project (*Curr. Sci.*, 1996, **71**, 64–74), regarding deployment of student power to monitor India's lifescape with the twin objectives of conservation of biological diversity and stimulating the interest of students in this area, is an excellent move in this direction.

Some suggestions given to improve science instruction in the American public schools (*Sci. Am.*, 1999, **287**, 64–71), also emphasize some of the very same points. These include – replacement of memorization with exploration and invention, concentration of instruction on fewer key concepts, instead of attempting to cover a large number of topics superficially, and assessment of performance not regurgitation. Also, children's beliefs and preconceptions about science may be used as ideas to serve as starting points for experiments and these may be followed by discussions on scientifically accepted explanations.

By training students to develop better analytical skills, we will not only get better scientists but also more logical citizens.

Apart from dealing with the 'Dinosaur Syndrome' of science education, the evaluation system must concern itself more with evaluation of a clear understanding of the scientific concepts.

Interestingly, in an editorial on 'Information overload' P. Balaram has clearly pointed out that many people may conclude that 'information' is the key to many of our problems (*Curr. Sci.*, 2000, **78**, 533–534). In my opinion, after filtering out the relevant scientific information, proper communication of key concepts and ideas is crucial so as to nurture and foster the process of scientific thinking in students.

Only when the scientific-thinking-skill is developed in young minds, can we expect originality and new innovations in science and technology. Needless to add, scientific literacy must be coupled with good career opportunities, proper material benefits and a conducive scientific atmosphere to attract bright youngsters to science.

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