The sum of ego & challenges



Jayant V. Narlikar

PARENTS OFTEN ask, how could they bring motivation to their child. How can a bright child be motivated to use his or her talents maximally? A short answer is: Make the child face challenges.

As a 12-year-old kid I learnt what a challenge means when we had my maternal uncle, Morumama, staying with us. He had come as a student for M.Sc. mathematics at the university and was to be with us for two years. While it was fun to have him around for games like cards and chess, or for verbal banter, we found another avenue of interaction.

This came through unexpectedly, through blackboards. My father had installed two blackboards in the walls of the long veranda at the back of the house for me and my younger brother, then aged 10. They were meant for drawing pictures, geography maps, or playing games like noughts and crosses. Morumama thought of another use. One fine morning when I walked into the veranda I saw that the smaller of the two boards carried a few lines in the neat handwriting of Morumama. The title of the text caught my attention: "Challenge Problem for JVN". The text below carried the problem.

As I was reading it, in sauntered Morumama. He told me that the problem would stay on the blackboard till I solved it; or until I confessed my defeat at not being able to solve it. I looked at the problem more carefully. It was more a puzzle than a numerical exercise and I began to think about it. Mathematics was my strong point and so I felt confident that I would solve the problem. I used the other board for my attempts and soon discovered that the problem was not that simple. Indeed it took me well over 24 hours to solve it. But the fact that I did solve it boosted my morale no end. I had won my duel with Morumama.

As I expected, this was not the end but a beginning! Morumama had other problems in his stock which he unloaded on the blackboard from time to time. The problems were different although the title the same: "Challenge Problem for JVN". I solved quite a few of them in the long run, while some I could not. Win or lose, the underlying motivation came through that word — "Challenge".

This magic word is known to bring out the best in a person. My own ability in mathematics grew impressively without my becoming aware of it. I, therefore, strongly recommend the challenge aspect in school education. Perhaps, to entice more students to solve the challenge problem, there may be some reward for the first correct solution. But in the long run, the human ego simply thrives on the feeling of having achieved success.

The challenge aspect has played a key role beyond the school years too. Those who have read Isaac Newton's biography will recall the challenge problem Johann Bernoulli posed for European mathematicians. The problem is simple to describe. A and B are two points in a vertical plane as on a wall, and a smooth wire connects them. A lies above B and is not vertically above it. A bead starts from rest at A and slides down the wire from A to B. What should be the shape of the wire so that the bead takes the shortest time to slide down from A to B?

The problem is deceptively difficult and for six months nobody could solve it. Then Bernoulli arranged to have the problem sent to Newton. Newton at that time had left Cambridge and, in his capacity as Master of the Royal Mint in London, was somewhat removed from the world of science. The challenge, however, spurred him into thinking. Having seen the problem on his return home from work in the evening, he sat down to solve it. And solve he did, by early hours of the morning. He sent his solution to the Secretary of the Royal Society, asking him to send it to Bernoulli *without* revealing the solver's identity. However, when Bernoulli saw the solution he guessed that only Newton could have solved it. He is reported to have said: "I can tell the lion from its paws".

Mathematicians have loved to have tricky problems to face as challenges. In modern times, the list of 23 problems announced in the year 1900 by the celebrated German mathematician David Hilbert have served as the challenge problems to generations of mathematicians. Not all of them have been solved yet and whenever a problem is solved (or claims to have been solved), it makes world news in the select world of mathematicians.

I have given instances of mathematical challenges as an example of motivating youngsters in school. One can talk of challenge problems in scientific fields like physics or chemistry, problems not involving rote learning, but requiring the application of brain.

Here I wish to distance myself from many of the quiz programmes which require an encyclopedic knowledge but not necessarily independent thinking. Scientific problems need not be confined to theory alone. One can think of experiments, too.

The Inter-University Centre for Astronomy and Astrophysics in Pune has an ongoing programme of interaction with school children. The programme is led by Arvind Gupta, who has developed countless number of "toys". Each toy is made from scrap material and seems at first to have magical properties. In the last analysis one sees that the toy functions this way because it is obeying some scientific law; the same law that appears in the student's textbook. Only at school it is taught as a mantra to be memorised rather than a beautiful manifestation of nature.

I wish the school syllabi would allow at least one period per month when a challenge problem could be posed, discussed and answered, not by the teacher but by some bright student..

■ *JAYANT V. NARLIKAR, a renowned astrophysicist, is professor emiritus at Inter-University Centre for Astronomy and Astrophysics, Pune University Campus*