

tion are so high and that the gullible public will rush like lemmings to charlatans, often at considerable costs in terms of money, time and energy, only indicates that traditional education in this country has collapsed almost completely. Unless we are honest enough and admit this staggering failure caused by ill-founded policies and actions over the decades, there is little hope for a proper education for a young person in this country in science or for that matter, in any other subject. Indeed, the sorry

state of science education is only a small part of the much deeper systemic rot.

A colleague in IIT-Kanpur cynically remarked to me that IIT did not even need to teach the B Tech students anything. They knew everything. All IIT would need to do was to provide a certificate that the candidate had cleared the IIT-JEE. This in itself would be sufficient to get a software job in Bangalore or a visa to the USA.

Of course, we all know that engineering degrees lead to H1-B visas to the

USA, even though one might be only a computer coolie there. This might well be the prevalent opinion today, in which case I am happy to retire hurt, saying that I have already seen too much.

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Reference problems

A few months ago I happened to take note of a very simple matter generally considered as inconsequential by scientists. I was trying to find out the meaning of a scientific term from a very thick book with over 500 pages. As usual, I saw the index first, took note of the page number and flipped back to the indexed page. There the keyword was printed in blue colour (a rare utility feature). Within a few seconds I got the meaning. I could save at least 5 min by not searching the full page, since the word was printed in blue. Now let me show the difficult side, a book with poor indexing and non-detailed contents page. It can take tens of minutes to find out the needed item.

Now take the case of scientific articles published in journals, books, etc. In almost all references in the lists at the end of the papers, the specific page number to which the citation is made is

absent. All journals print only the range of pages for research papers cited in the article and published earlier. This takes away considerable amount of research time if scientists want a verification of referred items. Also, referring ways are different from journal to journal. Hence, it is necessary to state in the references the exact page number or numbers (separated by commas) in the cases of books, reports, chapters in edited books, review papers and other papers. This measure can save time for researchers (as illustrated earlier) who study the published papers with verifications of cited articles and takes only a few minutes more for authors when they prepare their manuscripts. A conservative estimate of possible time and money saved is 5 million research hours and 400 million rupees per year for India alone. This is about 5% of CSIR's annual budget. (This takes into consideration

only 50,000 seriously working scientists out of a total research and teaching staff of over 0.4 million in CSIR, ICAR, ICMR, universities, etc.). Following are some good examples for referring to books and reports:

1. Constantine, G., in *Biology of Bats* (ed. Wimsatt, W. A.), Academic Press, New York, 1970, vol. 1, p. 320, pp. 319–322.
2. Ramage, C. S., *Monsoon Meteorology*, Academic Press, New York, 1971, p. 75, p. 82.
3. Chundawat, R. S., Technical Report No. RR-1, Wildlife Institute of India, Dehra Dun, 1990, p. 27.

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