A systematic approach to improving writing skills

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A recent note by Jacobs *et al.*[1] (based on quantitative data) in *Current Science* mentions that 'many authors of the rejected papers have fundamental difficulties in their writing and presentation skills'. Nobody is expected to learn a psychomotor skill, such as riding a bicycle, swimming or driving without practice. The same goes for learning to play a musical instrument or achieving a level of competence in any sport. Yet, even the scientific community appears to equate competency in writing with college education, if not literacy, in bemoaning the poor writing skills of postgraduate students and young researchers. Guided practice, controlled progression from basic skills to advanced skills, regular evaluation and watching master performers are routine to any systematic, long-term effort to acquire a skill. Writing is no exception. Based on my experience as a researcher, scientific copy-editor and teacher, I should like to prescribe, in the manner of an old-fashioned general practitioner, a 'mixture' to all those who aspire to be better writers. The mixture comprises (a) extensive reading, (b) a modest amount of progressively difficult writing assignments, (c) revising one's writing, and (d) developing a concern for readers.

The single most effective way to be a better writer is to be a diligent reader. As Bernard Dixon puts it, '... read great prose ... the lessons of style, clarity, rhythm, balance and syntax will sink in by subconscious osmosis'[2]. It is possible, simply through massive exposure, to absorb typical patterns of English sentences and to string words together in those patterns without any formal study of grammar. However, that volume can come only from books and not newspapers or newsmagazines. First, only books can offer large tracts of text. Second, and more important, such text is better crafted because its authors and editors have more time than their newspaper counterparts to polish it. 'The average adult reading speed for English prose text in the United States seems to be around 250 to 300 words per minute'[3]. Assuming the average book to be of 100,000 words, the average Indian student is likely to take at least 8 h to complete a book. More than anything else, it is time that emerges as the major constraint – fitness trainers promise visible gains in muscles after about three months of regular exercise; I suppose it is reasonable to expect a detectable improvement in writing after reading, say, about twenty books.

Massive exposure to correct patterns is in fact the most natural way of acquiring a language. Empirical evidence supports this: 'Pattern associator memories are highly sensitive to changes in the statistics of their input. When given a small number of oddball items, they memorize their patterns individually; when given a torrent of items sharing a pattern, they go with the numbers, extract the pattern, and run roughshod over the individual items, gradually reacquiring them over many subsequent bouts of training'[4]. I suggest a diet of light reading to absorb the basic patterns of English and to imbibe correct grammar. Books for the young (Enid Blyton, Capt. W. E. Jones and Richmal Crompton are some authors that come to mind) and pulp fiction suit the purpose very well and so does the recently launched Quick Reads series from Britain. The guidelines for authors of Quick Reads are instructive: short words of no more than two syllables, short sentences that average 15 words, short paragraphs no longer than 10 lines, chapters no more than 7 pages and short books (about 130 pages or 20,000 words) to 'encourage millions of adults to read their first book'[5]. From this, the aspirants move on to light fiction of their choice, from the much-vilified Mills & Boon to current favourites such as John Grisham (average sentence length 10.5 words), including a sprinkling of older favourites such as Arthur Hailey, James Hadley Chase, Alistair MacLean and even Harold Robbins. The handy 'Very Short Introduction to' series from Oxford University Press, including such titles as *Particle Physics*, *Molecules* and *Global Warming* is also promising and probably will go down better with the authorities[6]. The idea is to read racy stuff in large quantities (Hailey's *Airport* is about 160,000 words) merely as a stepping stone to the prose of masters.

Who are the masters, then? Winners of the Aventis prize[7], the Pulitzer prize (in the category 'Explanatory reporting')[8], authors whose work is featured in such series as *The Best American Science Writing* and *The Best American Nature and Science Writing* (selections from magazines) or anthologies such as *From Creation to Chaos: Classic Writings in Science*[2] and *Best Science Writing: Readings and Insights*[9]. Just as regular weight-training makes it possible to handle heavier weights, the earlier reading prepares students for more serious stuff. Richard Dawkins's average sentence runs a little over 20 words, Rachel Carson's *Silent Spring* takes it to 23 words, while the majestic *Discovery of India* is close to 23.5 words per sentence. [Note: Amazon.com offers such information for many books; on the webpage of a book, after 'Product Details', look for 'Inside the Book' and then under Text Stats.] Recommendations for non-science books are purely subjective: I favour Bill Bryson (winner of the Aventis prize for his *A Short History of Nearly Everything*), Conan Doyle's Sherlock Holmes books, Alistair Cooke, Gerald Durrell, George Mikes, Somerset Maugham and Mark Twain. I am sure other readers will include Isaac Asimov, Jared Diamond, George Gamow, and Robert M. Sapolsky. However, the staple reading for most researchers is research papers in their disciplines, and if that reading is to contribute to better writing, a good starting point is a paper titled 'How to read a scientific article'[10].

The pattern of examinations in India increasingly favours the so-called objective questions, which make no demands on expository writing; poor writing skills, therefore, pass unnoticed. Any prescription for better writing, therefore, must include writing assignments. I suggest that such assignments begin with writing at least ten sentences (each at least 8 words long) at random, progressing to ten sentences on any one topic, and then on to rendering in the learner's own words, a page or so from any of the books mentioned above, followed by repeating the exercise with any research paper from any appropriate journal. Writers of research papers do not have to search for suitable topics and have enough material to write about them – definite advantages that are denied to aspiring writers from other walks of life – but they also lack freedom: research writing is rooted in the concrete world and not one of imagination. What is more, scientists writing about their research are expected to describe their

methods explicitly enough for other researchers to replicate them in their own laboratories. Research writing is also constrained by two other requirements, namely the traditional IMRaD structure (introduction, materials and methods, results and discussion) and the even more rigid formatting requirements spelt out in such style guides as *Scientific Style and Format*[11] and the *ACS Style Guide*[12].

As readers, we seldom realize that the good writing we see in print is the result of re-writing and revising, not merely to eliminate misprints but to make the writing easier and clearer. Students should be encouraged to edit one another's writings to see why revising is necessary and how it contributes to better writing. Having one's writing professionally copy-edited or using style checkers such as the Boeing Simplified English Checker[13], which can check for such common errors as missing articles (based on count and mass distinctions) and unapproved verbal auxiliaries (passive, progressive, perfect, modals) serves to highlight recurring faults. Researchers writing about their work seldom realize the need to organize their writing – not only in terms of the overall structure but also at the level of sentences – for readers who are not as familiar with the subject as the writers: The science of scientific writing[14], with examples taken from molecular biology and geology, shows how sentences can be recast for clarity, demonstrating in the process 'a number of rhetorical principles that can produce clarity in communication without oversimplifying scientific issues' and establishing that 'complexity of thought need not lead to impenetrability of expression'.

The last point is that effective writers are considerate to their readers, a point particularly important in this context because a great deal of scientific writing is motivated by considerations other than communication. As a *Current Science* editorial once put it, 'Writing for a lay audience has very little social prestige among scientists. Students who sometimes indulge in this enterprise are told that they are wasting their time and professors who do so are told that they have run of out ideas for doing science'[15].

As Somerset Maugham concludes his thoughts on writing prose, he observes: 'If you could write lucidly, simply, euphoniously and yet with liveliness you would write perfectly: you would write like Voltaire'[16]. It is not given to everyone to write like Voltaire but, given time and inclination, we all can produce workmanlike prose.

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Biodiversity hotspots: Defining the indefinable?

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Nature distributes its valuable biodiversity unevenly across the earth's surface. This variety of life on earth is in rapid decline. In recent past, the field of conservation biology has been dominated by the goal of protecting the biodiversity for future. Conservationists are meticulously attempting to conserve the biodiversity from anthropogenic erosion and 'pre-natural' extinction. However, conservation of biodiversity for sustainable life in future is a difficult task due to the following major barriers: (i) Inadequate data on diversity and distribution of flora and fauna across the earth, (ii) Inadequate funding for conservation efforts and research, and (iii) Confusion and controversies in selection of areas for conservation. The last barrier is a critical one that is troubling conservationists to a great extent today. Conservation of maximum number of species at a minimum cost is the primary goal of global organizations concerned with conservation of biodiversity. It is clearly an unreachable goal at present due to the above-mentioned major barriers. Another remarkable fact is that the economic strength of the nations, especially developing countries in the tropics with rich biodiversity is also weak. It has been budgeted that the cost of conservation action varies by several orders of magnitude from area to area; an essential factor that also needs greater attention[1]. In brief, lack of precise taxonomic data on global biodiversity and its distribution, lack of proper methodology for selecting areas for conservation and inadequate funding are the major problems today in conservation planning.

The idea of biodiversity hotspots (BHSs) as a solution for preferring areas for conservation of biodiversity was first proposed by Myers *et al.*[2] in 1988. They used species endemism and degree of threat as two basic criteria for defining BHSs. According to them, BHSs are areas featuring exceptional loss of habitat. More precisely, to earn hotspot status, a region must harbour 1500 or more endemic plant species, which are found in that particular area but nowhere else, and it must have lost at least 70% of its original habitat, primary vegetation. By matching these two criteria with global biodiversity distribution databases, they identified 25 hotspots comprising only 1.4% of the land surface of the earth but confining as many as 44% of all species of vascular plants and 35% of all species of the four groups of vertebrates except fishes. By considering additional criteria, viz. endemic species/area ratios for vas-