

Nurturing the art of scientific writing*

Communicating science is as important as doing science. The written form of science communication requires the skill of simple, structured, correct and action-oriented expression. To improve these skills among Indian scientists, science faculty and researchers, the Current Science Association, Bengaluru organizes workshops on science writing. The ninth such workshop in the series was held recently.

Fourteen participants from different institutions and fields of science participated. Among them, four were science faculty, seven were scientists and three were researchers.

A month prior to the workshop, participants were introduced to each other and oriented towards the workshop through discussions on a Google group. They shared their views on topics such as science and the constitution of India, science and policies of the government, the vision of India as a global leader in research, scientific infrastructure in India and a comparison of science in different countries of the world.

Participants were advised to take on-line tests to check their reading speed.

The participants also selected one research paper each, which they found interesting and were willing to write about during the workshop, from the provided list of papers.

Ravi Mishra (National Centre for Polar and Ocean Research (NCPOR), Goa) was the local coordinator. He gave an informal introduction about details of the workshop.

The workshop was conducted by K. P. Madhu and Gita Madhu, and other resource persons. Madhu introduced the participants to *Current Science*, the leading interdisciplinary journal in India. He discussed the mandates of the journal and the various categories of manuscripts published in it. The take-home message was that science writing is not about writing papers and reviews only.

He mentioned the key problems found in the articles submitted to the journal, i.e. structure, flow, language and lack of consideration to readers.

Then there was a discussion on what science is and how it differs from other forms of knowledge, technology and innovation. Madhu stressed the need to use science as a verb instead of a noun. He discussed the methods of science such as induction, deduction, experimentation, verification, falsification and critical spirit. He also elaborated the nature of science, and various myths and realities associated with it.

In the post-lunch sessions, T. S. Suryanarayanan (Vivekananda Institute of Tropical Mycology, Chennai) gave an overview of how to write a research paper. He elaborated on the purpose of each component of a research paper and the way it should be written to serve that purpose. He also discussed the relevance and importance of tables, charts, figures and graphs in scientific papers, and gave tips to improve the quality of these important features of scientific papers.

On the second day, the session started with Rudyard Kipling's famous poem about the six wise old men, who teach us everything: what and why and how and when and where and who. Madhu discussed the characteristics of these questions in detail. He also gave the participants a task: write three 'why' questions to overcome inhibitions about asking questions. Later, these questions were grouped and discussed.

The ability to question, think critically and seek logical consistency in answers was emphasized by Madhu using issues such as the ozone hole, global warming and female foeticide. He requested participants not to believe everything seen in the media or read in scientific papers. Good scientists do not hesitate to question even the experts, if inconsistencies in logic or evidence are detected.

In the next session, Gita talked about the challenges of writing in English, which is a second language to us. She suggested inputs of good writing, writing in short sentences and to read aloud one's own writing to detect any problems. The day ended with a prescription:

reading a poem, a short story and a literary essay everyday to improve one's writing.

The third day started with the participants discussing the research papers selected by them. Each participant briefly summarized his/her research paper in story format.

The primary, secondary and tertiary sources for science were then clarified. The primary sources are journals. Science dailies and magazines are secondary sources. Keeping track of the primary sources can be done easily with databases such as the Web of Science and Scopus. Madhu suggested using android applications such as 'Researcher', and gave tips on accessing papers behind paywalls. He elaborated on the different sequences in writing a scientific paper, and different ways of reading it. He described the method of reading a paper for reporting.

The session on 'science communication' started with stressing the need to differentiate between information, education and communication. Madhu discussed the principles and practice, flows and forces, and modes and skills of science writing for communication. He mentioned the communicators' dogma: to move from simple to complex, specific to general and known to unknown. He also pointed out the differences between science education and science communication.

Clarity, cohesion, coherence and consideration for readers are the four Cs one needs to keep in mind while writing. The structure–function relationship, the 'keep it short and simple (KISS) principle' and the 5Ws & H are some of the key factors for effective writing.

Gita discussed the functions and attributes of sentences, the pitfalls of using too much jargon and too many nouns, and demonstrated how to replace nouns with verbs to make writing more dynamic. She introduced different resources to bookmark and clip from websites and applications for scheduling time such as Cozi and Google Calendar.

On day four, Madhu laid out the steps, 'search–research–read–reflect–write' to write an article. He introduced the

*A report on the workshop on science writing organized by the Current Science Association, Bengaluru and hosted by National Centre for Polar and Ocean Research, Goa from 26 May to 2 June 2019.

various tools and techniques for authentic search, making notes, grammatically correct writing and organizing digital knowledge resources using webclippers such as Evernote, PDF file managers such as Mendeley and bibliography managers such as Zotero, to name a few.

He also talked about science in print, radio and video. Using some examples of paintings and music, he introduced the elements of aesthetics in composition. The importance of story-telling in writing was emphasized. In order to write in a coherent and cohesive manner, he suggested that the participants break sentences into small phrases and rearrange to make them easily comprehensible.

The following day, Sanjay Pai (Columbia Asia Hospital, Bengaluru) talked about 'Ethics in research'. He discussed the various examples of fraud in research in different fields. He commented upon the reasons and the costs of fraud in research. He also warned the participants about pseudo-journals and predatory journals.

In the post-tea session, Pai talked about the issue of plagiarism. Besides discussing the ongoing falsification and fabrication of scientific data, he also suggested possible ways to avoid this trap.

The afternoon session was conducted by Karthik Ramaswamy (Indian Institute of Science, Bengaluru) on the 'Science of scientific writing'. He started his talk

with a discussion on why writing is important. Is there something like good or bad writing?

He suggested understanding writing as a process of 'write-rewrite-plan/think'. He introduced the participants to the principles of re-writing. Start with something familiar to the reader and end with new and complex information, he advised. Be concise and coherent. He gave tips on dealing with anxiety and anticipation, etc.

The next day, participants used the training received to do a report on the papers selected by them. They also started editing each other's work.

Then there was an activity to ensure that the participants understand the message of the paper, the target group that needs to get the information, the communication channels that can be used for the purpose and organizations that can help in reaching the message across to the target group. Madhu also provided insights on writing grant applications and project proposals.

On the last day, Madhu summarized the key points of the workshop and discussed the specific problems of participants.

M. Ravichandran (NCPOR, Goa) addressed the participants and distributed certificates.

G. Madhavan (Current Science Association) gave a brief overview of the history and composition of *Current Science*.

Besides the evaluation of the workshop elicited through a Google form, there was a short session for informal feedback-cum-suggestion at the end. Some of the key points that emerged are as follows: The workshop provided the confidence to write. It explained the know-how of scientific writing. It helps train creative thought processes in the long run. Many of the mistaken beliefs about scientific writing were shattered by this workshop. It provided orientation towards future prospects. The participants suggested that more time should be allocated to the description and usage of digital tools.

Current Science should devise ways for authors to track submitted articles. Measures should be taken to reduce the review time of articles. The journal should be popularized through social media.

The hospitality by the host institution, the organizers and local staff was appreciated by all the participants. Mishra presented a vote of thanks.

The immediate output of the workshop in terms of stories written by the participants has appeared in the Science Last Fortnight column in *Current Science*.

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MEETING REPORT

Disaster Risk Reduction in Kullu district, Himachal Pradesh, India*

The rugged landscape of the Indian Himalayan region elevates the risk of hazard events and holds back socio-economic development opportunities for remote and vulnerable communities. Particularly notable are landslides, floods, forest fires and earthquakes. A recent international assessment of disaster impacts (1996–2015) revealed that India as a whole suffered the fifth largest mortality, especially related to flood events¹.

*A report on a multi-stakeholder meeting in June 2018 in Kullu to discuss and develop local disaster risk reduction approaches.

The 23–24 September 2018 floods which impacted the Beas River watershed in Kullu district, Himachal Pradesh highlight the significant damages (to infrastructure and environment), disruption and costs that disaster events inflict upon us. It is therefore important for society to develop a better understanding of how the magnitude, frequency and impacts of these hazards are shifting in the context of climate change and variability, land-use change, and increasing mountain populations^{2,3}. Challenging these risk conditions, international, multinational and national disaster risk reduction

(DRR) frameworks (e.g. The Sendai Framework 2015–2030 (ref. 4); Asian Regional Plan, re-appraised at the July 2018 Asian Ministerial Conference on Disaster Risk Reduction⁵, and Indian National Disaster Management Plan 2016 (ref. 6)) are driving transitions to resilience, in which people and communities are central to achieving disaster reduction. Resilience is defined as: 'The ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including