Workshop on Writing Science: Structure and content

There are three separate temporal components in the workshop.

I.   One month long group interactions on a discussion forum where all participants are members. It calls for ten to fifteen minutes of online time twice a week, from the participants.

II.   Eight days of intensive and immersive face-to-face workshop where the participants have to commit six hours per day to spend together in group and two hours individually

III.   After the face-to-face workshop, platforms are created for continuing to practice the skills under mentoring and guidance.

I.   Email discussion group

The first virtual component of the workshop is intended to provide knowledge resources and links related to science and to writing. Scientists and science faculty work within narrow disciplinary constraints. The first task is to open up a broader perspective on scientific research in India. The vision of the big picture changes the way we do science in our narrow fields, making it more effective. To open up this vision, we start with the following content in the email discussion group.

1. Science in Indian constitution
2. Science in Policies
3. Science in Plans
4. Programmes and schemes for scientific research
5. Organisation of science in India
6. Infrastructure for scientific research in India
7. Vision of India as a leader in scientific research
8. Science in India - Comparison with other countries
9. Growth Indian scientific output
10. The quality of the contemporary scientific output from India

Discussions, based on the resources and links provided, are initiated. The applicants are provoked to think along, thus orienting their attitudes towards science in India. The attempt is to provide the participants the missing components in their science education, awakening them to the History, Philosophy, Methodology, Structure, Sociology, Politics and Economics and culture of science - provoking the participants to develop their scientific temper / attitude / spirit.

Introductions to websites/pdf files and networks related to writing and communication are the second part of the virtual workshop. Here again, discussions are initiated so that the attitudes are oriented towards the knowledge resources provided on writing in general and writing science in particular.

The group interaction is used to ensure that the participants know a little bit about each other before they meet in the face-to-face workshop. This helps to reduce time and effort spent in small group formations during the workshop.

II. The eight day face-to-face workshop:

Having partly fulfilled the requirements of background *knowledge* and having attended to some of the *attitudes* necessary, we focus on the relevant *skills* to fulfil the role of a science writer, during the face-to-face workshop. The knowledge contents of the face-to-face workshop are limited to those that are important in improving the necessary skills.

Thus on the first day, the skill in focus is the ability to ask questions. And the ability to question the answers received.

Linking the existing understanding of the participants to issues related to writing science starts with understanding of how scientists communicate with each other through scientific papers, reviews, etc. and comparing it the structure of communication in patents. Skills in focus: Fast reading without sub vocalization, internalisation of the idiom of language

To be able to understand the background and foreground of research papers, to cross check information and to be able to distinguish between the authenticity, credibility, reliability of new information, and to all this within deadlines, participants must need to understand the tools and techniques of search. Starting with advanced search strategies in Google to Google Scholar, Directories and Databases are demonstrated. This is followed by actual search done by the participants.

The participants will have to familiarize themselves with the digital tools and techniques to search in the realm of the content that they want to communicate, within deadlines. The skills introduced during the first two days are put to practice.

The structure of scientific papers have evolved over the past few hundred years and is still evolving. Referencing standards have diversified in the last century. The digital tools and resources that have come up in the last two decades are revolutionizing the way science is done and is published. But there are principles of communicating science that does not change: the structure of the elements of a scientific paper depends on the functions.

The structure of scientific papers, fairy tales, dramatic plays, feature films, news reports etc. are examined to bring out the principles of unity, harmony and contrast in cognitive compositions.

The different ways of reading a scientific paper – for different purposes – are examined. Different ways of writing papers are also examined. The relative merits of text, charts, tables, figures, photographs for representing the results are discussed. Data analysis and representation/visualization is a growing field. The participants are directed to resources that can be pursued for their own growth in this field.

The notion of the relationship between structure and function are further stressed in the discussion on reading/writing reviews, writing grant proposals and project reports.

The main focus of the workshop is on writing. The processes involved to create well researched, well structured pieces. The participants have to write on a recent paper in a manner that is

comprehensible, engaging, and yet rigorous. Here the tools and techniques of wordsmiths come into focus. Speed in keying in with QUERTY keyboards is the essential skill. The skill in chiseling words, and the technique of creating flows from one sentence to the next are introduced. Demonstration of editing, group practice under guidance and small group editing of stories ends the day with the first draft of stories.

Whatever is written has to be oriented to specific target group(s). To enable the understanding of distinction between readers and target group(s) and to frame the information in a way that is acceptable to the publisher(s) we will play a game. This enables structuring of the 'story' as per the relevance to the reader, importance to the publisher.

The angle and the focus of the stories by participants and their value to the readers will be discussed. Skills in focus are: ability to pitch, ability to treat the content as per the target audience, keeping in mind the context of the discovery, context of the reader, context of the platform and the context of the scientific environment.

Developing a tolerance for terminology, ability to translate technical terms into common speech, the ability to numb the numbers as per reader's needs and the tools and techniques to practice these skills to attract and sustain readers interests calls for story telling strategies. So a quick analysis of structure of the story, its pace, progression of emotions, aesthetics, grammar and literary devices become useful.

A major limitation for Indian scientists is English language. Even though Indians spend an extra ordinary amount of time in English classes, most scientists write such that the paper bounces back from the editorial desk itself, because of the mistakes in language. The workshop examines the most common English mistakes made by Indian scientists, and orients the participants to the ways to overcome them. Language skills are not easily acquired in an 8-day workshop. So the inputs are sustained over time using the online platform.

Ultimately, the mathematical yardstick of keeping the communication to what is necessary and sufficient, precise and logical, is the key characteristics of good science writing. The participants must be given enough time to get feedback from multiple sources so that the stories that they write become more readable and acceptable to a wider audience. Group and individual feedback on what has been written leads to refinement of the stories.

Literature search, reading, comprehending, formulating, writing, rewriting, reformulating and restructuring the content for a specific purpose and target takes more effort and time from the participants.

Output and outcome: By the end of the workshop, the participants would have written 300 words about a recent research done, in a style that is publication worthy. The participants would have understood the concepts of structure and flow of ideas as well as unity of content.

The participants have an experience of doing it once, they may not be confident that they will be able to do it again, later. So the exercise is continued online.

Those who do learn to use the notions of structure and flow are provoked to write 1500 words, a mini-review, describing the recent trends in specific areas of their own research interests.

The workshop does not end.

III.   Online mentoring and feedback

The group that was formed before the workshop becomes active again after the workshop. Now the participants have a choice: they can drop out. But those who want, can continue writing and continue getting feedback and mentoring online, till they become confident enough to write papers, reviews, grant proposal and project reports.

There are participants from workshops conducted in 2016, who still continue taking advantage of this opportunity, to improve the quantity and quality of their reports, articles, reviews and proposals.