



**SCIENCE JOURNALISM AND COMMUNICATION IN INDIA: CHALLENGES
AND WAY FORWARD**

Anshul Joshi*

House No. 177, Rail Vihar, Sec-33, Noida, U.P., India

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ABSTRACT

Science Journalism and Communication is all about 'rational thinking and approach'. It can challenge 'blind faiths', cure 'mass hysteria' & 'false public beliefs' through rational reporting. Science communicators bridge the communication gap between the complex scientific world and the common masses. Today science journalism is increasingly going online, where the possibilities of offering rich content, including info-graphics are virtually limitless. Besides, there is investigative science journalism, which is becoming very popular across the globe. However, the right kind of communication is a common problem. The responses, some of them from scientists, highlight the need to have more trained science communicators not only in the print, electronic and social media, but also in the area of documentaries and film making.

If we are communicating anything related with science to Aam Aadmi (Common Man), then What, Why, Where, When, Who and How of that 'particular' theme needs to be explained to him in a 'lucid' and 'lay-man language'. As till the time we don't do this, we won't be able to achieve the real goal of 'Science Communication'. All communication and journalism training institutions should have science communication as one of the core/compulsory subjects, not as an optional subject. Formal training would help; enrich skills of writers/reporters to write better scientific reports, articles and scripts for newspapers, magazines, short films/documentaries respectively. The quality of the press releases and background material that come from research institutions/laboratories has much to do with enabling or not enabling accessibility to the general reader. What is well said in press release will be well understood; and what is well understood can be well covered and conveyed journalistically. Given the often technically demanding nature of the task, interviews with scientists who can well explain their work to people outside their field, can become favourite form of science journalism.

Although much has been achieved in India, there is still an urgent need to make science communication activities more rampant, both in terms of quality and quantity. We have yet to make a dent in wiping out superstitions that have prevailed throughout the ages, particularly in tribal and backward areas where literacy levels are low and superstition is a way of living life. Also, the general public is still largely ignorant about common scientific principles, facts and phenomena.

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INTRODUCTION

Information is needed to make informed choices and to update ourselves with time. We all have an 'awareness instinct' within us. Science directly or indirectly influences our well-being, life-style, and survival. The past two decades have witnessed a phenomenal growth in scientific activities and practitioners of science communication have also increased. However, a basic question remains in the popular academic discourse that – What exactly is Science Communication?

In what ways it is can affect public awareness and understanding of science, scientific culture etc. There is a wide range of discourse on science communication today. Nevertheless, 'science' and 'communication' are two different terms, differing in meanings and essence. To examine what science communication really is, one has to clearly define the meanings of both the terms. Each of the terms has however multiple meanings in different respects and contexts.

In loosely defined terms, Science Communication refers to mass media presenting science & related information to non-scientists and non-scientific communities in a simplistic 'lay-man language', which is easy to understand. It is the processes by which the scientific culture and its knowledge are

*Corresponding author: **Anshul Joshi**

House No. 177, Rail Vihar, Sec-33, Noida, U.P., India

incorporated into the common culture (Bryant, 2004:1). Science Communication and Journalism is all about 'rational thinking and approach'. It can challenge 'blind faiths', cure 'mass hysteria' & 'false public beliefs' through rational reporting. Science communicators are those who bridge the communication gap between the complex scientific world and the simple information requirements of stakeholders or the masses.

Science communicators require appropriate skills, media, activities and dialogue to produce and promote the following responses:

- Improving knowledge on health, environment and ethical issues.
- Awareness, including familiarity with new aspects of science and research.
- Interest, by voluntary involvement with science through communication.
- Opinion of stakeholders for higher resource allocation.
- Understanding of science, its content, process, factors associated with it.
- Analytical Approach, Application of Logic and an Enquiring Temper.
- Rational Thinking and Scientific Temper.

As India is technologically advancing, the need for diffusion of scientific information to the non-scientific community is also growing fast. India has made a phenomenal progress in science and technology in the past few decades. However, to what extent the science and scientific knowledge is actually transmitted to the common masses remains a tricky question in India. Several programmes and initiatives have been launched to promote science and communicate science by bridging the gap between science and common masses through diffusion of information but still a lot more needs to be done. The primary concern is to help science and scientific cultures penetrate India's diverse society and to transform India into a nation of scientifically thinking and scientifically aware people. Science communication, thus serves as a medium for bridging the gap between the scientific community and the common masses. It is also an effective tool for extending scientific boundaries and for gaining wide public support for important research and developments happening in the world, which are indispensable for society's welfare.

Science journalists cover an impressive array of fields where advances are rapid, their impact on the society is wide-reaching and the boundaries are constantly being redefined. It is rewarding because science journalism helps us understand the new possibilities and opportunities that science & technology has opened for us. It takes enormous skill and dedication to present the complex news of scientific discoveries and explorations in a language that is accessible to the general reader. The distinctiveness of science journalism lies in producing a prose that is simple but not simplistic, that respects the intelligence of a reader without being condescending. A science journalist is a truly multi-tasking person as the subjects he/she covers are very wide and deep both in their scope and content.

Science journalism goes beyond what daily newspapers, magazines, and the broadcast media do in the traditional sense. It is increasingly going online, where the possibilities of

offering rich content, including info-graphics are virtually limitless. It includes relatively accessible material published in reputed scientific journals. Besides, there is investigative science journalism, which is becoming very popular across the globe. However, the right kind of communication is a common problem. The responses, some of them from scientists, highlight the need to have more trained science communicators not only in the print, electronic and social media, but also in the area of documentaries and film making. All communication and journalism training institutions should have science communication as one of the core/compulsory subjects, not as an optional subject. Formal training would help; enrich skills of writers/reporters to write better scientific reports, scripts and articles for newspapers, magazines, short films and documentaries.

The quality of the press releases and background material that come from science/research institutions/laboratories has much to do with enabling or not enabling accessibility to the general reader. What is well said in press release will be well understood; and what is well understood can be well covered and conveyed journalistically. Given the often technically demanding nature of the task, interviews with scientists who can well explain their work to people outside their field, can become favourite form of science journalism.

VIGYAN PRASAR - Indian government initiatives to promote science communication includes VIGYAN PRASAR-an autonomous organisation of the Department of Science and Technology set up in 1989-which plays an important role in coordinating efforts among various scientific institutions, educational and academic bodies, laboratories, museums, industries and other organisations for the effective exchange and dissemination of scientific information. Vigyan Prasar also develops and disseminates software materials and organises popular science events including workshops, debates and lectures. The principal objective is to serve India's science popularization agenda. This is achieved through several strategically important two - way stakeholder specific approaches to communicate about principles and practice of science/technology and implications for development and quality of life.

NISCAIR - National Institute of Science Communication and Information Resources

Another organisation is CSIR - NISCAIR, which came into existence on 30 September 2002 with the merger of National Institute of Science Communication (NISCOM) and Indian National Scientific Documentation Centre (INSDOC). Both NISCOM and INSDOC, the two premier institutes of the Council of Scientific and Industrial Research (CSIR), were devoted to dissemination and documentation of Science & Technology information.

The mission of this organisation is to become the prime custodian of all information resources on current and traditional knowledge systems in science and technology in the country, and to promote communication in science to diverse constituents at all levels, using the most appropriate technologies. It's aim is to provide formal linkages of communication among the scientific community in the form of research journals in different areas of Sci & Tech, disseminate Sci & Tech information to general public, to inculcate interest in science among people, act as a facilitator in furthering the economic, social, industrial, scientific and commercial

development by providing timely access to relevant and accurate information and to develop human resources in science communication.

Science communication involves expertise from multiple disciplines (Fishhoff & Scheufele, 2012):

1. Subject matter Scientists, to get the facts right;
2. Decision Scientists, to identify the right facts, so that they are not missed or buried;
3. Social and Behavioral Scientists, to formulate and evaluate communications and communication practitioners, to create trusted channels among the parties.

For the most part, though, individual scientists are on their own, forced to make guesses about how to meet their audiences' information needs. That's why colleges and universities need to do a better job of training scientists to communicate well & explain their work.

There are immense possibilities to communicate science through:

1. Traditional Journalism (both print and broadcast)
2. Live or face to face events: public lectures, debates, dialogue, science centers, science museums, etc.
3. Online Interactions: online journalism, internet sites, blogs, wikis, podcasting, facebook, twitter etc.

Media and Science

In the age of the internet, social media tools offer a powerful way for scientists to boost their professional profile and act as a public voice for science. As the benefits become more apparent and dedicated metrics are developed to supplement scientists' portfolios, social media has today become an integral part of the researcher's toolkit. As much of the ongoing research, is funded with public money, it is evident, the need to inform the public about the research results, so as to allow interested people to follow the ongoing developments and to form their own opinion on the basis of sound, science-based facts and data. Scientists, policy makers, and academicians have to think creatively about new directions for rebuilding science–society interfaces so that society can participate in the ongoing debates surrounding emerging technologies. Communication of laboratory research and recent innovations needs to be done with common public. There is a need to present timely news, research, analyses & insights on grassroots based environmental/science related struggles and realising the importance of ground-level reporting. It is absolutely necessary to build a collaborative infrastructure between science and society.

In addition to the scientific journals (both popular and technical) published by the government, several national and regional daily newspapers have now slowly started producing weekly science pages/columns. Regular science exhibitions, science fairs, demonstrations, seminars, workshops, lectures, scientific tours, conferences etc. have the advantage of being interactive forms of science communication and therefore need to be promoted more. Although much has been achieved in India, there is still an urgent need to make science communication activities more rampant, both in terms of quality and quantity. We have yet to make a dent in wiping out superstitions that have prevailed throughout the ages, particularly in tribal and backward areas where literacy levels

are low and superstition is a way of living life. Also, the general public is still largely ignorant about common scientific principles and phenomena.

How Digital Media Can Affect Science Communication?

By using Twitter, researchers and academicians can discuss and communicate scientific topics with different types of audiences with various point of views. Studies indicate that the use of Twitter can positively impact the number of times a scientific article is cited. These studies show that articles that are highly tweeted are eleven times more likely to be highly cited than those which few people have tweeted. In 2017, a study done by the Pew Research Center of Journalism and Media found that "About a quarter of social media users follow science related pages and accounts. This group places more importance and comparatively more trust on science news that comes to them through social media".

Digital Media has become a powerful marketing tool today which allows individuals, institutions and organizations to interact with one another, build relationships and communities online. That interaction can be more personal to users than traditional methods of outbound marketing and advertising. Social networking sites act as word of mouth or more precisely, e-word of mouth. The Internet's ability to reach billions across the globe in seconds has given online word of mouth a very powerful voice in today's digital world. Unlike traditional research methods such as surveys, focus groups and data mining which are very time-consuming and costly, and take weeks or even months to analyze, people today use social media to obtain 'live' or "real time" information/reaction. This is highly beneficial and least expensive medium of communication in this dynamic and fast-paced world. Social media can act as a communication channel by targeting and following very specific sections with the help of social media influencers and popular social media personalities. Of the top 10 factors today that correlate with a strong Google organic search, seven are social media dependent. This means that if any Organisation/Community is less or non-active on social media, they tend to show up less on Google searches. Therefore, Twitter, Facebook, Youtube, LinkedIn, Google+ etc. have today emerged as leading platforms for all the global leaders and thinkers.

Audience has today become the 'king-maker' and the major distributors for spreading media articles/work. Using Mobile Phones, now a single person can report, shoot and edit his own news stories. Mobile Phone has today become a 'news-room' in pocket which saves time, money and effort of a journalist/reporter.

Challenges Faced By Science Communication

- Science Writing or Science Journalism remains under-developed in India. The large segments of the population even do not have access to basic scientific knowledge due to illiteracy and in absence of seriously planned roadmap for disseminating scientific knowledge to the non-scientific community. India has an impressive scientific heritage. Scientific research-in fields such as Biology, Medical Sciences, Mathematics, Astronomy, Medicine, Physical Science and Material Science-have been carried out in the Indian sub-continent since ancient times. However, a remarkable gap has persisted between the scientific knowledge and

the 'common' people as not much efforts have been made to bridge this gap.

- India's engagement in science promotion activities is multiplying and diversifying with time. But how does India fare in science communication compare to other developed countries is often debated in the academic discourse. India's science promotion activities are happening mostly at the institutional levels, whereas science journalism is yet to make any big breakthrough. Scientists are publishing their work in research journals but are not communicating with common people. Despite witnessing a phenomenal growth in mass communication in recent decades, the growth trajectory of India's science communication is limited, restricted and do not look too much promising. Science writing/reporting is mostly concentrated among the scientific community and academic institutions, and is shackled by complacency and over dependence on foreign sources (Patairiya Manoj, 2002).
- Science writing/reporting still tends to be dry and boring, making it unsurprising that few science articles interest newspapers and magazines. The number of capable science communicators and voluntary scientific organisations is alarmingly low and hardly sufficient to cater to the country's large and diverse population. Science is not succeeding in attracting mass media's interest. It rarely appears as a lead story, as editors and reporters do not consider science to be 'news' in the normal sense. On an average, science only accounts for around 3% of the total coverage by India's mass media.
- One of the main reasons for media not giving enough importance to science news/columns is less readership and viewership. It is difficult to cook a story on science with heavy technical and jargon oriented words, hence due to lack of effective and engaging storytelling, it doesn't excites the readers much.
- Journalists who work in various Indian regional languages often seem to face special challenges in covering science as they have to make science understandable to the readers of regional languages. Translation of technical words and jargons is a near impossible task; such translations make the content matter almost unintelligible to common people.
- The mainstream media coverage on issues related to science and technology is alarmingly poor and limited. Despite heavily promoting science and science education, publications of scientific materials have increased only marginally. In India, people generally view Science and Technology merely as a career option or a way to 'make a living' (by becoming doctors and engineers) rather than admiring the philosophical, conceptual and ideological side of Science.
- Low priority in science reporting in the mainstream media is also deeply rooted in the country's journalism history. The press had always been obsessed with political affairs happening in the country. The lack of interest among the mainstream media on issues related to science and technology stems from the fact that science writing, requires proper training and skills. It is a lengthy, of course a laborious process as the communicator has to first understand the subject himself, simplify the scientific terms in non-scientific language and then communicate it in common man's

language. There is a scarcity of trained journalists who can explain things in a 'lucid' and 'lay-man language' to common people.

- Science journalism is yet to be materialised as a lucrative career opportunity in India. There are only a handful of Institutes in the country that are offering basic trainings on science communication and journalism. Hence there is a long way to go. There are other important factors as well which are major obstacles in science journalism such as communication gap among journalists & lack of proper planning/training; cultural and political opposition; scientific community's fear of media distortion; bureaucratic, corporate and legal obstacles while covering a science story; as well as scientists wanting to keep secrecy of their ongoing research/project.

How to Promote Science Communication?

1. Audience today needs shorter, crisp stories that move quickly and are visually appealing. Hence Podcasts with shorter stories and more visuals can popularise science communication. There is an increased opportunity for digital science writers, content curators and scientists. Science writing can be expanded and modernised through videos, animations, podcasts, quiz games, puzzles, slide shows etc.
2. There is a need to inspire action by painting a picture of an imperfect world without science that can be repaired through collective human efforts and action using scientific knowledge and temperament. We need to gauge the mood of public and the level of their understanding. The stories of science need to be connected with civic issues and problems faced by citizens on a regular basis and must be taken to it's outcome. Stories need to be followed and covered till the very end for making comparisons between Past Scenarios and the Present Scenarios. As only then we can see the change, a story has brought to a society.
3. Science stories can break the myths, old stereotypes and wrong presumptions created in the society. There is undoubtedly a hunger in the form of curiosity in the minds of people for good stories. We just need to hit the right chord and produce right content in reader friendly language. We have to take science to common man by 'simplifying science' in 'lay-man language'.
4. Story-Telling is the 'Future' in Journalism: Journalism is all about 'storytelling' and there is a lack of storytelling in science communication. Text 'Informs' or Tells' but Story 'Shows & Communicates' emotions. Information can lead to 'Knowledge' but a Good Story can lead to a 'Revolution'. Thus, Scientific news and developments have to be explained in the form of stories. Stories should be visually powerful and attractive so that they can be sold well. We have to keep this in mind that a science story would be competing with thousands of stories coming from politics, economy, foreign affairs etc. Hence, the science story needs to be impactful enough to compete with all other stories and find it's place.
5. Scientific temperament will be strengthened, when scientific news will find place in the mainstream media. Science Journalists need to develop contacts with Research Centers & PhD institutes and should interview

the Scientists, Experts and PhD Scholars working there for writing good stories.

6. Most importantly, science communication activities must be conducted and governed in a systematically planned manner, under one umbrella organisation, and according to a properly defined national policy. We need to identify partner NGOs, stakeholders and organizations working in this direction.

One of the initiatives taken in this direction was – AIPSN. An All India People's Science Network was created in 1988, with 28 constituent voluntary organisations. AIPSN functions as a common platform for interaction on Science and Technology issues/learning. It organizes All India Peoples Sciences Congress every two years to discuss various issues in Science and Technology.

Major areas of AIPSN activities are:

1. Science Communication and Publication
 2. Health
 3. Education
 4. Environment, Energy and Sustainable Development
 5. Agriculture
 6. Rural Technology
 7. Decentralization
 8. Cultural Communication
7. But the formation of networks of organisations alone is not sufficient. A suitable mechanism must be evolved to ensure that we work together in a more cohesive manner. We immensely need a formal Science Media Network to connect and associate with all science editors, writers, journalists, columnists, translators, bloggers, 'scientoonists', illustrators, media-persons, producers, and media organisations interested in science coverage. Developing Science & Technology Communication Culture and Skill combined with the concept of technology marketing can bring people closer to science communication.
 8. Musical Parodies about Science and Scientific Innovations can be used as communication channel and tool to promote science communication. Youtube Channels like "AcapellaScience" is doing great work by promoting science in the form of musical parody of popular songs. Evo-Devo (Despacito Biology Parody) and The Molecular Shape Of You (Ed Sheeran Chemistry Parody) by A Capella Science have already become huge hits on Youtube. Aside from aiding better communication, songs may potentially improve learning and memorization, by also helping students feel relaxed and welcome in stressful situations during exams, engaging students through multiple modes and modalities simultaneously. Hence such initiatives need to be promoted for making science communication and learning more fun and enjoyable for viewers.
 9. Science stories should include more animation, infographics and must be crisp, short and to the point to attract viewers' attention. Title of the story should be catchy, newsy and should pull out well, the content of the article. While writing, motive of your story should be clear in the first paragraph itself with all the essential details.

10. Colleges and universities need to do a better job of training scientists to communicate well and explain their research work. Scientific/Research Organisations must highlight the work being done by them regularly on their websites. Students who are majoring in science should be required to take courses, how to communicate scientific research to the public. In addition, universities should offer more workshops to train scientists who have already begun their research careers to communicate with media more effectively and on a regular basis.
11. Entertainment and persuasion including humour, storytelling and metaphors can be used by science communicators. If the public will enjoy science more, then there would presumably be more funding for scientific projects, progressive regulation, and more trained scientists. More trained engineers and scientists could allow a nation to be more competitive economically. Science can also benefit individuals as living in an increasingly technological society (of 21st century), background scientific knowledge can help to negotiate and understand various things and concepts in a better manner. Governments and societies might also benefit from more scientific literacy, since an informed electorate promotes a more democratic society and enhances the quality of decision making.
12. It is a common observation that folk media-such as puppet shows, street plays, stage performances, nukkad natak, folk songs and dances-successfully reach segments of society where other forms of media have limitations. These traditional means of communication can be exploited as alternative media for science communication. They are not only entertaining, but also offer two-way communication and are cost effective. Where print and electronic media have limits and lack of accessibility, folk media can play a crucial role.

CONCLUSION

There is no doubt that scientific information is becoming an essential and integral part of people's daily lives. Present and Future Science Communication efforts can have great potential in shaping the lives of the people and making their decisions more informative and rational.

However, illiteracy and ignorance are major challenges. While literacy levels are increasing, scientific literacy is still drastically low. Given India's large population, limited resources and multitude of languages, make science communication particularly face great challenges. There have been efforts to popularise science through our regional languages, for example by producing some scientific publications in vernaculars and translating certain television and radio programmes, as without more attention on local languages, much of the population will miss out on enhancing science communication efforts (Patairiya Manoj, 2002). In order to create awareness among illiterates or the newly literate - folk forms and story-telling need to be used more frequently. In this way, superstitious beliefs and practises could be wiped out from society and a scientific environment as well as temperament can be created even at the grassroots level.

A multi-prolonged strategy is required to make science communication more effective and to address obstacles

associated with it. Scientists need to be trained in the art of science communication while journalists must be oriented towards atleast the basic understanding of sciences and its methodology. More platforms should be created to engage scientists and media practitioners to have close dialogues on issues pertaining to latest scientific developments.

When the journalists and the scientific community exchange communication on issues related to science, it creates a mutual understanding, which in turn yields positive outcomes (Mochahari, Monjib, 2013). More seriously planned agenda and policies for science communication in a truly transparent manner are a pre-requisite to engage and speed-up science communication as great emphasis is put on the wonders of science and respect for scientists, rather than on any analysis of the work being done or any anticipation of its effects on society.

Last but not the least, the issue of departmentalism is a serious problem that must be fixed strategically to enhance free flow of scientific information to the non-scientific community.

While transmission of information remains important, the bigger challenge remains to develop scientific temperament and positive attitude towards science communication. And, the Scientific Temperament will only be strengthened when scientific news will find place in the mainstream media.

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