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Science Communication and Social Upliftment

Narender K. Sehgal

Abstract

We examine how science communication can help make more and more people scientifically literate and aware. Also, to keep them that way, i.e. scientifically aware and literate, science communication needs to be continual, persistent and sustained. Social upliftment, in very simple terms, means turning 'have-nots' into 'haves'. We will see that the only way science communication can help do that is by enabling, empowering and motivating the have-nots into putting in the required effort to lift themselves, out of their present condition, into the category of haves – and having done that, help others to do the same, and never to allow themselves to revert to their earlier condition.

Science communication is a term that covers a lot of ground, in terms of what it can do directly for people, and in what it can help us achieve indirectly. Social upliftment falls in the latter category – unless an increase in scientific literacy of the general public, itself, is considered as one among essential parameters that characterize social upliftment. As one who has been for long advocating and working for promoting scientific literacy as an essential trait for every self-respecting citizen of India (and of this world), I would certainly include it high in the list of essentials for social upliftment.

Scientific Literacy and Scientific Awareness

Science communication is done in a variety of ways, and for a variety of purposes and audiences, employing a whole range of media and means. For purposes of this piece, however, we will restrict ourselves to science communication of a particular kind, aimed at masses of common people. This would imply that we are talking about 'science' and scientific laws and principles at work all around us – at home, at place of work, and in between – in our everyday lives. Incidentally, the word 'science' is used here in its widest meaning and popular parlance, to include its methodology, culture, applications and technology as relevant. In other words, we are referring to 'science communication' of the type that would promote scientific literacy and ever-increasing understanding, awareness and grasp of scientific aspects of issues and questions that concern and confront us continually in our daily lives. To elaborate, let us see what this kind of

(i) It can raise, or create, awareness about an issue, or a useful practice; against a harmful practice, tradition, or a superstition.

(ii) It can empower people with information, practical knowledge, explanations of things unknown, useful skills, etc., for generating or increasing income; or for more efficient use of available resources.

(iii) It can help demystify so-called miracles performed by self-styled godmen, technologies, or things like uncommon natural phenomenon, diseases etc. that generate needless awe, fear, or apprehension.

(iv) It can help prepare people to handle man-made or natural disasters, and their after-effects better.

(v) It can help in safer and more efficient use, handling, and maintenance of modern-day gadgets, implements and devices.

(vi) It can help teach people to make better and more informed purchase decisions to get the most out of their money, while buying things for long-term use.

(vii) It can help people become more quantitative and do simple quantitative analysis to help in their investments of savings for better future for their children and themselves.

(viii) It can encourage people to adopt logical thinking and reasoning, more and more often in whatever they do, with real life examples, which get the message home effectively.

(ix) It can help raise levels of scientific literacy among people in general, which in turn could have a number of beneficial effects in many ways.

(x) It can make people aware of all the good potential of developments taking place in science, and of those in the pipeline. Equally, it can make and keep them aware of harmful effects resulting from misuse and abuse of technology already taking place, and of similar future possibilities.

A good number of government institutions, non-government and voluntary organizations are involved in science communication in the country. Of these, only a handful of central government institutions are devoted solely to science communication, whereas quite a few others have 'science communication' only as part of their much larger mandates. Prominent ones in the former category are NCSTC (the National Council for Science & Technology Communication, DST), New Delhi, NCSM (the National Council of Science Museums, Ministry of Culture, Government of India), Kolkata, and Vigyan Prasar (an autonomous institution under the Department of Science & Technology, Government of India), New Delhi. There are a good many in the latter category, both at the Centre and State levels: NCERT (the National Council of Educational Research and Training, MHRD, New Delhi), NISTADS (the National Institute of Science, Technology & Development Studies) and NISCAIR (National Institute of Science Communication & Information Resources) of the CSIR (the Council of Scientific & Industrial Research, Ministry of Science and Technology, New Delhi), and the State Science and Technology (S&T) Councils in almost every State and Union Territory. In addition, there are "Science Cities" – really, very large Science Centres – in West Bengal at Kolkata, in Punjab near Jalandhar (on the Kapurthala Road), and in Gujarat, near Ahmedabad, run either by the respective State S&T Councils or under some other State set up especially created for the purpose. We will come to the non-governmental and voluntary sector organizations a little later.

The only reason these institutions and organizations find mention here is because, together with NGOs and voluntary organizations active in this area, they form the back-bone of the entire science communication edifice in the country. Barring exceptions, the overall impact of science communication, on the Indian population, can be likened to a few puffs of air reaching individuals from a small number of ceiling fans of a large, packed auditorium. In other words, aside from a small number of honourable exceptions, most of the science communication programmes on offer are generally meant to spread awareness on issues or topics of current, or perennial interest, on an upcoming celestial event – like a total solar eclipse, a lunar eclipse, coming of a periodically visible comet, clusters of meteor showers, occultation of the sun by a planet, etc. – or celebrations of historical events, birth anniversaries of famous scientists, of important scientific discoveries, or of the annual National Science Day, instituted in 1987. Such programmes generally include one or more of the following: popular lectures, exhibitions, debates, competitions, essay writing contests, quiz programmes, and the like. These are generally interesting and informative activities alright, but do not amount to much in terms of any lasting impact on the audience.

Let us look at the ongoing science communication efforts in the country, in terms of the sections of our population that are being reached, and with what frequency. Such efforts can be roughly divided into two categories: One, where visitors to venues of science centres, science museums, and planetaria (almost all located in big or moderately large cities) make up the audience; and two, where activities and programmes are conducted at different places (both urban and rural) around the country, almost literally attempting to take science to the people. Some of these programmes/ activities are:

* long duration theme-based campaigns
* specially made serial radio and television science broadcasts
* large-scale field programmes like the Bharat Jan Vigyan Jatha (BJVJ) of 1987 [1]
* science fairs
* annual children's science congresses conducted, since 1993, with the help of voluntary agencies and their networks, all over the country
* the outreach activities conducted with the help of mobile vans

In category one, a very large proportion of the audience is made up of school students brought in organized groups and batches, the rest being tourists and those belonging to the urban middle-class who can afford to pay for transport and entry fees, and use their visit as an occasion for a family outing. In category two, also, school students do form part of the beneficiaries, but the much larger proportion is of the general public, of both the urban and rural variety – and this is especially true of the audience for radio and TV broadcasts of science serials – and those reached via projects like the BJVJ.

For any communication to succeed with a given audience, the message or information to be conveyed has to be delivered to the audience, repeatedly and simultaneously, in many different and interesting ways. Additionally, if a way can be found to make the audience participate in activities where the same message/information is being applied practically, it would enhance the chances of retention of the desired information by the audience. Such a recipe is of particular importance in science communication, for, along with a high level of retention, the correctness of the information conveyed is crucial.

Close attention needs to be paid to the formulation and design of the essential content of the message or information to be delivered. This will depend on the audience itself, as also the medium and mode to be employed for delivery. If the content designed can match sensitivities, sensibilities and interests of the audience, the receptivity and retention levels are likely to be enhanced, increasing chances of successful delivery. But even with all this, communication through mass media necessarily and largely are one way, non-interactive and sans any audience participation, limiting its effectiveness. However, to a certain extent, effectiveness can be enhanced by using innovative software design, media-mix, and mode of delivery. Good examples of this are two highly successful and acclaimed weekly radio serials, *Vigyan Vidhi* (1989) in 13 parts and *Manav Ka Vikas* (1991-94) in 130 parts, jointly produced by NCSTC and All India Radio and broadcast by the later from all its stations (barring Vividh Bharti commercial stations), spread around the country, numbering well over 120. To supplement and complement the weekly broadcasts, specially designed charts and do-it-yourself kits (one each for every 3-4 episodes for *Vigyan Vidhi*, and a smaller number in the case of *Manav Ka Vikas*) were provided to all registered listeners – 140,000 children of 10-14 years, for *Vidhi Vigyan*, and over 100,000 children (again 10-14 year olds) and 10,000 schools for the *Manav Ka Vikas* serial. In each case, there were built-in episodes (roughly once, every month) to answer listeners' queries. Please see Note [2] for more details.

With whatever we have on the ground, in terms of 'science communication' infrastructure, in the country, it is highly unlikely that, barring school students, many in the audience being reached are getting multiple exposures. Multiple exposures (to the right type of science communication) would help the audience retain, supplement, and reinforce knowledge and awareness picked up during their very first, or later, exposures. Those who do, do so courtesy their ready access to the printed word (newspapers, magazines etc.) and/or the electronic media, i.e. radio, television and the internet. Many school students, too, get to do so via their class room, or other co-curricular activities in most of the private, and some of the government, schools, or at home, via radio, television and the internet. Unfortunately, there is no dedicated TV channel for science in India, which could supplement, complement, support and reinforce science communication efforts being made in the country. This is not to undermine, or belittle, the excellent science programmes one often gets to watch on channels like the National Geographic, Discovery and the Animal Planet. They are also quite popular, and being watched by a good number of Indians. They, however, can not fill the gap that needs to be filled by a dedicated Indian Science channel. If all the Indian institutions engaged in science communication in India were to pool their resources to set up a TV channel dedicated to science, and attuned to supplement, complement, support and reinforce their efforts, they will find the outcome well worth the effort.

Meaning of Social Upliftment

How now do we relate all this to 'social upliftment'? To answer that, we first need to understand what this very general term means. Social upliftment could mean a lot of things; in fact, different ones to different people. 'Social' according to one dictionary means: of, or relating to society or its organization; concerned with the mutual relations of human beings or of classes of human beings; living in organized communities. According to another dictionary, 'social' means pertaining to or concerned with human beings and their relations to each other; of, or dealing with living conditions, health, etc., of human beings.

Viewed in this light, 'social upliftment' would generally mean improvement in the living conditions of the common people, including their health of course. In the Indian context, it is our people living below the poverty line, who need social upliftment the most. They suffer from most of our perennial problems arising out of insufficient, or inadequate, food, clothing, and shelter; poverty, illiteracy, unemployment, lack of sanitation, access to safe drinking water and medical facilities; and discrimination on grounds of caste, gender, and religion.

We need to be more specific and, of what has been described above, see what can be effectively and meaningfully addressed using science communication. Notwithstanding, what has been stated above, a very simple way of understanding what 'social upliftment' means is to view it as transformation of 'have-nots' into 'haves'! On the face of it, this appears to be a simple and rather neat idea: divide the whole population into two groups of 'haves' and 'have-nots'. At any given time, there is an ongoing two-way movement of people between the two groups, i.e. some 'haves' becoming 'have-nots' and some 'have-nots' turning into 'haves'. Effective social upliftment would imply accelerating one of the movements and decelerating the other so effectively that there are none left in the 'have-not' category. Thus, converting 'have-nots' into 'haves' is 'social upliftment'. But the simplicity and neatness of this idea disappears as soon as we try looking into what makes one a 'have-not'. It is not one, but a whole host of things, ranging from food, clothing and dwelling; to illiteracy, poverty and unemployment; to depravities of various kinds arising out of discrimination based on caste,

creed, religion, physical disabilities, certain medical ailments, and more, which contribute to the making of the 'have-nots'. That would have been alright, except for the fact, that 'haves' in one category could be 'have-nots' in one or more other categories, and vice-versa. Examples: A person, otherwise qualified, may not get a job, merely because he/she was born into a so-called scheduled caste, scheduled tribe, or a particular religion. So a person who is in the 'haves' category as far as education is concerned, would be a 'have-not' employment-wise. A woman may face discrimination in matters of employment in certain jobs, or promotion, and so on, merely because of her gender; an individual, afflicted with the AIDS virus, may not get treatment at hospitals, beside being treated as a social outcast, even by members of his/her own family. In many communities a child may be nutritionally, educationally and otherwise deprived merely because of her gender. There are countless other examples.

Empowerment and Motivation through Scientific Literacy

It has already been mentioned what science communication is capable of, if done right and properly. It can make one aware and knowledgeable of facts, things and explanations one never knew before. But leaving it at that is like doing only half of the job. Communication ought to continue, persistently reinforcing it with what and how this new knowledge and awareness can bring tangible benefits, if made use of, in appropriate situations – as brought out through real life examples. Such effort should be sustained till the newly gained awareness, knowledge and skills start being put into use in real life by the audience.

Done properly, as described above, one could set a primary goal for all science communication efforts: To equip every one in the population with what we may call "Minimum Science for Everyone (MSE)" [3]. MSE, clearly, would have to have three essential components: (i) Acquiring knowledge of certain scientific principles and facts, i.e. a "minimum science" package; (ii) internalization and application of the method of science; and (iii) acquiring the ability to continue to learn forever. Incidentally, MSE also points to a definition of 'Scientific Literacy', i.e. any one equipped with knowledge and application of MSE would qualify to be considered "scientifically literate".

A scientifically literate citizen is likely to keep him/herself more aware and better informed about matters/issues/events/questions/everyday happenings with scientific and/or technical contents or aspects which concern or relate to his/her everyday life (health, education, employment, housing, food, drinking water etc.) and security; and those concerning/relating to his/her family, community, city, state, and country. In addition, a scientifically literate person, among others, is likely to be:

(i) better placed to critically examine and analyse pros and cons of issues with scientific content;
(ii) a better participant in debates on issues concerning science and technology because of informed opinion(s);
(iii) better able to appreciate technological advances and to make use of them to his/her advantage;
(iv) less inclined to take things for granted and more inquisitive and in the habit of asking questions;
(v) less affected by superstitions and blind beliefs;
(vi) better able to differentiate between fact and fiction;
(vii) better able to argue his/her case on an issue of importance; and
(viii) more confident and self-assured in any discussions.

For science communication to equip an individual with the aforementioned MSE, there is a crucial component which needs elaboration, i.e. "internalization of the method of science (MOS)". MOS is all about finding answers to questions, solutions to problems, explanations for natural or other phenomena, unraveling of mystery and more. It is the methodology used in the practice of science, which is subject to logical reasoning, objective and transparent; its results are interpreted without bias; are made available through publication, including all the details and underlying assumptions, and are reproducible, by others willing to go through the same process. For all practical purposes, it involves core physical (and mental) operations of "observation", "hypothesis", "prediction" and "experiment" (to test the prediction), applied together cyclically till we arrive at the correct hypothesis which provides answer to the question we started with.

Coming to what "Internalization of the method of science" means, it will be easy to understand this if you can recall what you went through in learning to ride a bicycle, or drive a car. You know you can't learn any of these by watching others doing it in person or in a video film, or by listening to someone lecturing on how to ride a bicycle or drive a car. For the former, you would have to get on a bicycle and try to learn by actually doing it. In the process, you may fall a couple of times and get a few scratches on your arms or legs. But once you have learnt how to ride a bicycle (or to drive a car),

it becomes an integral part of you – i.e. gets internalized by you. After learning, and some practice in actual traffic, riding a bicycle (or driving a car) will come to you so naturally. In the same way, you can internalize the MOS by first learning to use it, and then apply it by practicing it on 'solving' a few actual real-life problems. Thereafter, applying it to any and all kind of situations will come to you so naturally.

From this elaboration, we know now the kind of 'science communication' we need to put the audience through, to equip them with the MSE. Equipped thus, as defined already, people who become "scientifically literate" would already have acquired a trait which can be their stepping stone to 'social upliftment'. Practice, it is said, makes one perfect. Likewise, the practice of the MOS, in more and more real-life situations can provide one the needed empowerment, and every little success the needed motivation for the next bigger success – to lift oneself out of the 'have-nots' category and move into the category of 'haves'. A woman, equipped with the MSE, once she is empowered and enabled to lift herself out of the have-nots into the haves, can help others do the same (via the multiplier effect). Others, thus equipped and transformed, can do the same. And once empowered thus, and having tasted success, it is unlikely any of these new 'haves' would ever allow themselves to fall back into the 'have-nots' category.

Notes

1. Bharat Jan Vigyan Jatha (BJVJ) of 1987: A unique communication event conceived, catalysed, and supported by the NCSTC and executed by 26 voluntary organizations, from all over the country. Highlights: (i) Zonal Jathas started simultaneously from Madras (now Chennai), Malda, Solapur, Imphal on October 2, 1987, and on October 3, 1987, from Srinagar, culminating in a rally at Bhopal on November 7, 1987. (ii) Together, these Jathas covered 25,000 Kms, with over 500 halts, through 446 districts and almost all States and Union Territories. (iii) Key themes: Self-reliance, National integration, building a Peoples' Science Movement. (iv) Stressed communication in local languages. (v) Communication means employed: Exhibitions, slide-shows, popular lectures, film-shows, street plays, S&T toys/models/kits, aero-modeling, sky-watching, quizzes, contests, competitions, songs, dramas, organized by over 500 local organising committees spread across the country, prior to and during the Jatha period. (vi) These events were covered extensively by All India Radio, Doordarshan, University Grant Commission's Media Research Centres, the Central Institute of Educational Technology of NCERT, and the Films Division. (vii) The Regional press covered it very well and far more extensively than the national press. (viii) Reached an estimated 70-80 lakh people directly, and many times more through the mass media, and (ix) Identified more than 500 groups throughout the country eager and interested in taking the message of science to the people.

2. Both these serials were broadcast simultaneously in 18 languages from different AIR stations – for instance, in Malayalam from Thiruvanantapuram, in Tamil from Chennai, in Telugu from Hyderabad, in Kannada from Bangalore, in Punjabi from Jalandhar, and so on. The charts and manuals for do-it-yourself kits were also provided to registered listeners in their own local language. The charts gave additional information to supplement and complement the content of the broadcasts. The kits gave them an opportunity to do something with their own hands, to engage in activities which helped them understand and be able to apply scientific methodology in things they could do with the help of the kits. By answering questions asked by kids in response to the serial broadcasts, an attempt was made to make these into interactive programmes in which the audiences (i.e. the listeners) were able to participate in some way. At the conclusion of the serial, quiz contests were held to do a follow up on what the audience had learnt in terms of the key concepts that were sought to be communicated.

Reference

This concept of "Minimum Science for Everyone" or "Scientific Literacy" – was presented by the author in a concept paper prepared for UNESCO, under its Participation Programme of 1998-99, on Promotion of Scientific Literacy & Culture. This concept paper also had an annexure which gave details of the suggested contents for a "Minimum Science" package. A few copies of this document may still be available with Vigyan Prasar, C-24, Qutub Institutional Area, New Delhi-110016.

Dr. Narender K. Sehgal retired as Adviser and Head, National Council for Science & Technology Communication, DST, and also as Founder Director, Vigyan Prasar (an autonomous organization of DST, Government of India), New Delhi.