

CONCEPTUAL FRAME WORK AND PARALLEL APPROACH OF PCST – AN INDIAN EXPERIENCE

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"Abstract"

Public Communication of S&T in India (PCST) is a fast growing area of legitimate inquiry and gaining the attention of the policy makers and the media equally. The concerted efforts over the years by Governmental and non-governmental agencies, working hands-in-hand have yielded highly encouraging results in defining and consolidating the conceptual framework of PCST in India. Continued efforts like BJGV-89, BJGVJ-92, and campaign built around natural phenomena like eclipses and programme like children science congress and recently concluded "2004 Year of Scientific Awareness" have proved the efficacy of indigenous parallel approach to PCST which is not only decentralized and participatory in nature but low in cost.

The paper highlights and analyzes the development of conceptual framework and parallel approach used for PCST as indigenous model in India.

Key Words: - Science Popularization, Science Popularization, Parallel approach, conceptual framework

1. Introduction

Public Communication of S&T in India (PCST), a country of billion plus, is a fast growing area of legitimate inquiry. It has been realized that the real key to treasure of scientific knowledge is PCST. It is evident that the people cannot play the role as global citizen if they are not scientifically literate and attitudinally rational. The importance of engaging people at large with S&T is now well appreciated at the policy and implementation level in India. . There has been an increasing understanding that S&T popularization and communication (as PCST known in India) can pave the way to overall progress and prosperity of the nation. Thus, the role of PCST is to build and maintain the bridge between science and the people through development, adaptation, promotion and use of different communication methodologies/mechanism to achieve better public understanding of science & technology. This is one of the concerns often stated in various S&T policies and planning documents drawn out time to time. The latest S&T policy 2003 of India in its objectives has clearly spelt out the importance and the commitment to support S&T communication as;

"To ensure the message of science reaches every citizen of India, man and women, young and old, so that we advance scientific temper, emerge as a progressive and enlightened society, and make it possible for all our people to participate fully in the development of science and technology and its application for human welfare. Indeed, science & technology will be fully integrated with all sphere of national activity. In strategy and implementation plan, it is further stated that

"Every effort will be made to convey to the young the excitement of scientific and technological advances and to instill scientific temper in the population at large"

"Support will be provided for programmes that seek to popularize and promote science & technology in all parts of the country. Programmes will also be developed to promote learning and dissemination of science through the various national languages to enable effective science communication at all level".

2. PCST- A Tradition in India.

India's tradition of S&T dates back several thousand years. Her major contribution in the field the astronomy, material science and mathematics is well known. This indicates that the impact of S&T on social and economical life was well recognized long back. The History of S&T popularization goes back to 19th century when few self motivated luminaries like Ruchi Ram Sahni and Hargoo Lal in Punjab, Prof. J.C. Bose in Bengal and Swami Satayaprakash in United province (present Uttar Pradesh) and Shivaram Karanth in south put up there might to take science to people, that too in their mother tongue. People's initiative for Science Popularization, however began before independence when a few organization like Vigyan Parishad (1913) and Orissa Vigyan Samiti started publication of scientific literature for common people. But science popularization took a form of peoples' movement after independence notably in Kerala in the farm of Kerala Sastra Sahitya Parishad, a name known for its pioneering efforts and noble approaches in S&T popularization.

After Independence, a number of government organizations were mandated for science popularization. Some of these institutions started the publication of popular science magazines in Hindi, English and other languages. A few of such notable agencies are Publications and Information Directorate (now National Institute of Science Communication), National Research and Development Corporation. The National Council of science Museum is also contributing in this direction through setting up of science centers, science exhibitions, science fairs, science cities and science museum. The eco/science -clubs have been established by Ministry of Environment and Forest and Vigyan Prasar. All India Radio, Doordarshan and other TV channels broadcast and telecast various science programmes. Central/State Government and several private groups have established several planetariums in the country.

Besides these, institutions like National Council of Educational Research and Training, Central Institute of Educational Technology, Consortium for Educational Communication, Directorate of Agriculture Information and Publication, Indian Council for Medical Research etc; also endeavor spreading of scientific knowledge concerning their areas of interest. Science popularization has also been taken up by many individuals and voluntary organizations.

Table I: Aims and Objectives of NCSTC and Vigyan Prasar

NCSTC	VIGYAN PRASAR
<p>Basic Objective of The National Council for Science & Technology Communication are:</p> <ol style="list-style-type: none"> 1. Popularization of Science and indigenous technology among the people; 2. Stimulation and nurturing of scientific and technological temper among the people; & 3. Taking all steps necessary to provide support for the above (I) and (II) including coordination/orchestration of S&T popularization activities throughout the country. <p>The major programme elements of NCSTC are :</p> <ol style="list-style-type: none"> 1. Training in S&T Communication. 2. Development of S&T communication software and its dissemination. 3. S&T communication networks/systems and coordination with the other agencies. 4. Field based programmes 5. Research in S&T communication. 6. Incentive schemes 7. Policy and Planning in science communication <p><i>Source:- Report, Third Review Group on the activities and programme of NCSTC, Department of Science & Technology, Govt. of India(1996-2002</i></p>	<p>Introduction: - Vigyan Prasar was set up by the Department of Science & Technology, Government of India, as an autonomous registered Society in 1989 for taking up large-scale science popularization task. The primary objective of Vigyan Prasar is to promote and propagate as widely as possible-a scientific, rational outlook in society. To achieve this, its efforts go beyond mere dissemination of information to a conscious attempt at inculcating amongst people the sprit of “scientific temper”. The broad objective of VP may be summarized as follows:-</p> <ul style="list-style-type: none"> • To undertake, aid, promote, guide and coordinate efforts in popularization of science and inculcation of scientific temper among the people and to increase the knowledge, awareness and interest about science and technology among all segments of the society. • To provide and promote effective linkages on a continuous basis among various scientific institutions, agencies, educational and academic bodies, laboratories, museums, industry, trade and other organization for effective exchange and dissemination of S&T information. • To undertake development of materials-audio, visual, audio-visual and printed-methods and modes of communication, so as to enable the masses to better understand, appreciate and comprehend abstract scientific principles and practices. • To organize research work, courses, workshops, seminars, symposia, training programmes, fairs, exhibitions, films shows, popular discussions, street plays, quizzes, song-dance-drama etc; in furtherance of objective of the society. • To participate in trade fairs, exhibitions and other mass forums as well as to develop syndicated features and to contribute periodically to newspapers, magazine and journals in order to disseminate and create awareness on issue of science and technology. • To undertake the design, development and construction of models, exhibits and other relevant instruments for hands-on visuals and other modes of communication. • To institute and award fellowships, stipends, prizes, medals and any other kind of monetary incentives. <p><i>Source:- Annual Report Vigyan Prasar) 2004-2005</i></p>

In 1984, with a view to consolidate, coordinate and catalyzed and support the effort of science popularization/communication at the micro and macro level in the country, the Govt. of India established the National Council For Science & Technology Communications (NCSTC) as an apex body. In 1989, Vigyan Prasar, an autonomous body was created for development and dissemination of software for S&T popularization like publications, books, films, CDs, TV/Radio programmes, posters, Kits etc. The specific aims and objectives of these agencies gave a definite direction for the

development of conceptual framework of S&T communication/popularization in India, particularly in governmental sector. Broadly these aims and objectives are as follows:-

2.1 The Aims

1. S&T Communication and Popularization in the country and:
2. Promote and propagate, as widely as possible, a scientific and rational outlook in the society.
3. Coordination and orchestration of S&T communication/popularization activities in the country.

2.2 Objectives & Goals (Why S&T Communication/Popularization?)

"Any science popularization activity or programme, be it designed for common man, children, farmers or women, has three major inherent objectives and goals", i.e.

1. To make people aware of scientific and technological developments to enhance the level of S&T literacy
2. To enable them to take an informed and rational decision and strengthen their decision making ability;
3. To develop scientific and technological temper in them which would reflect on their systematic and rational role, behavior and conduct in society.

3. Communication Approach & Strategy

The so-called modern approach, actually western, rooted deeply in science museum, science city, science exhibitions (fixed & mobile); displaying the latest gadgets or model of hardware etc. is capital intensive and highly centralized. Considering the many fold diversity (social, cultural, religious, linguistic and regional- unparalleled in the world) and target audience, of which 70 % still rural and a considerable section of which till date living below poverty and illiterate; the efforts from the very beginning were more on to establish and create parallel, more relevant, indigenous images of science and science communication. It was well understood that something more suitable to India will be an approach, which is decentralized, activity based, low cost, participation-intensive and allows our environs to be used as learning and teaching ground. It was also realized that through this parallel or alternative approach what we do or learn is to be directly and closely connected with real problem(s), situation, things and happenings in every day life. Accordingly, in all the major programmes and activities of NCSTC and VP the basic philosophy and premise always remain the same.

3.1 The basic premise and philosophy of all S&T Communication Programmes

- (i) *"For any S&T communication and popularization programmed to be effective, it has to be participatory, interactive and in a language employing an idiom which belongs to those one is trying to reach, or communicate with."*
- (ii) *"In any interactive S& T communication, the communicators involved too, have much to learn from those whom they may be trying to communicate with, even if the latter may not be either literate' or formally educated."*

3.2 Strategies to achieve the Goals of S&T Communication/Popularization.

Through parallel approach what is emphasize is as follows:-

- i. Reaching larger numbers of people across the country. To achieve this, among others, should begin in the form of major, large scale, coordinated projects on specific themes with specified objectives and time frames;
- ii. Reaching people using all possible media, both traditional and non-traditional, and by employing software in the language of target group.
- iii. Using the existing S&T communication software, producing new and additional software on a large enough scale, by using adaptations of the original software;
- iv. Developing proper manpower of various S&T communication tasks, including resource persons for parallel programme and activities; and
- v. Providing linkages to and martyring of all elements of the programme, and using other innovations not specifically mentioned above as per the needs of target group.

4. The major Steps

It was in 1986, the year when the Halley's Comet was making its cyclic appearance, a nation wide programme on theme, "**Comets and Other Celestial Objects**" was planned. A month long mass awareness programme was designed as per the above mentioned basic premise using parallel approach to answer the queries of people about the comets, myths and

superstitions associated with them. It was for the first time when several agencies (both Govt. & non-Govt.), scientists, activists, individuals, communicators, resource person from different part of the country came together on a single platform. Encouraged with the success of this programme, again a programme of large magnitude called **Bharat Jan Vigyan Jatha (BJVJ-1987)**, involving 26 agencies associated with people science movement and a number of Central and State Departments was designed and implemented. In fact this was the first programme when the conceptual framework and the parallel approach were put to test. It was the first ever programme in the history of science communication when direct contract was established with 20 lakhs people in the country. The validity of the approach was amply proven as same was used by Ministry of Human Resource Development during the National Literacy Mission (NLM). Subsequently two newsletters, "**NCSTC-Communications**" of NCSTC and "**Dream 2047**" of VP played an important role in defining and consolidating the conceptual framework of S&T communication in India through its various columns after the BJVJ-1987. The publication of these newsletters was started with a specific aim to network all organizations, individuals, activists and other stakeholders interested in the field of S&T communication/popularization. At present, these newsletters are being circulated to more than 31000 subscribers.

Over the past few decades, due to concerted efforts of dedicated individuals and organizations, the conceptual framework and the parallel approach has attracted an increasing number of adherents both among the common people and among communicators, cutting across several divides including the urban/rural. In fact, the approach and conceptual framework have been put to countrywide test several times after the BJVJ-87. The success and the large scale participation of people in BJVJ-92, and nationwide campaigns built around natural phenomena like eclipses, transits of planets, comets, Year of Scientific Awareness (YSA) -2004, World Year of Physics-2005, and programmes like National children science congress, mega radio serials, science clubs movement (VIPNET) etc; have not only validated the conceptual frame work of S&T communication/popularization but also proved the efficacy of the approach and methodologies used, which are found to be more in tune with Indian ground realities.

Table-II: Ten Major initiatives of S&T Communication in India based on parallel approach

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| <ol style="list-style-type: none"> 1. "Comets and Other Celestial Objects" 2. Bharat Jan Vigyan Jatha-1987 3. Bharat Gyan Vigyan Jatha-1990 (In support of National Literacy Mission) 4. Bharat Jan Gyan Vigyan Jatha-1992 5. Children's Science Congress (CSC), being organized yearly since 1993. 6. 114 episodes Interactive Mega Radio Serial "Evolution of Man", broadcasted in 16 languages simultaneously throughout the country at same time dame day. 7. Nationwide campaigns built around natural phenomena like eclipses, transits of planets, comets etc, 8. "Year of Scientific Awareness (YSA) -2004", covering 569 districts of India. 9. "Vigyan Rail (2003-2004)" & "Vigyan Mail (2005)"- Mobile Science Exhibitions on Wheels. 10. "World Year of Physics-2005"-an activity based programme for appreciating Physics in everyday life. |
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5. The Conceptual Framework of S&T Communication in India.

"In context of science communication, the word science is often used to convey a meaning which covers a much wider canvas than what it does when one talks of traditional, curriculum based science education. The word "Science" in science communication, therefore would not only cover physical or biological science, it would also take in their basic, applied and environmental aspect, together with their social, societal and economic dimension as well as their inter-relationship". So,

"S&T communication is not only flow of scientific & Technological information and facts from source to target group through some medium." "It also includes spreading and nurturing of scientific temperament/ values and method of science". "Mere dissemination of scientific information and facts is not to be confused with the main objective of science communication, or even of science popularization. In fact this can be a small, albeit an unimportant, component of the whole thing". Science-communication should aim at conveying that:-

1. Science is everywhere: at home, out in the open, at school, on the way to or from school and all around them; anything and everything that we touch, feel and experience has to do with one or another aspect of science.
2. Science has tremendous possibilities and potential-both good and bad. It is for us to ensure that 'science' is used only for good of people, society and the country.
3. Anyone and everyone can use the knowledge and the tools provided by science to one's and society's advantage.
4. Increasing adoption and internalizations of the method and values of science in every-day life can help one get more out of one's resources through their optimal utilization.
5. Research in S& T communication include development of field level projects with a view to studying and researching various existing impediments to the spread and promotion of scientific outlook/attitude/temper among people; and

devising and developing more effective communication methods, means, tools, techniques and technologies than those presently in use.

6. Development of evaluation methods and mechanism for determining the efficacy of various tools employed for S&T communication
7. Pools and survey to assess levels of S&T and attitude among various section of the population.

Accordingly, science communication ought to focus more on conveying the basic approach, the attitude, the method, the processes and the values of science and less on its content, facts and information. Particularly, for general and common people Science communication needs to aim at promoting and encouraging,

- Curiosity and a sense of wonder (meaning how and why) about things, happening, events/phenomena around them;
- Spirit of inquiry and asking and seeking well-reasoned and convincing answers to these questions;
- Keen and systematic observation of things, facts and oddities around them;
- Experiment to check out, verify, disprove or confirmed a suspicion or guess;
- Correctness, precision and meticulousness in whatever they do; and so on.

6. Important characteristics of Strategies and methodologies used for S&T Communication/popularization in India

- Use of all possible media, modes and methods of communication – traditional , non-traditional , electronic, non-electronic, including folk forms for effectively conveying messages and information for discussion, debate and exchange of experiences;
- Use of the local language and idiom in all communication especially folk forms;
- Use of Interactive and participatory form of communication.
- Emphasis on the learning-by-doing method and on low or no cost activities which employ common and easily available local material.
- A conscious effort to make communication as much of a two way process and preference to those methods and media, which allow more of this.
- Science communication on the whole and in overall Indian context includes a critical examination and assessment on a scientific basis of its age-old tradition in different areas (viz; agriculture, health, education etc), especially before entirely new or parallel things are sought to be promoted by way of dissemination of information.
- Science being a process and method rather than a mere branch of knowledge, naturally permeates every human activity. Whatever the topic and whatever the medium of communicator, scientific approach must form part of one's thought and actions, - Scientific temper must reflect at every state.
- A basic assumption that the communicators, in the process of science communication, also have a lot to learn more those whom they would be trying to reach or communicate with- even – in the case of those who might be illiterate in common parlance.
- Involvement of large numbers of people in the various stages and processes of communication.
- Preparing large number of resource persons through training in the preparation and use of common software materials prepared centrally as well as at the local level.
- Holding of workshops/rehearsal camps at different levels (nationally, and at the State-level) for science communicators, science clubs coordinators, teachers, science activists and so on.

7. Training Modules Based on Parallel Approach.

At present several activities, approaches and media have been tried and utilized by different agencies and individuals. As result, a good deal of infrastructure, software and human resources (science communicators) for different medium are now available in the country. A number of science communicators have been trained for different medium through full time academic courses and short-term courses in S&T communication to bridge the gaps, who in turn are taking up specialized science communication programmes and activities in their areas.

Over the year through the catalytic efforts and support of NCSTC and Vigyan Prasar, a number of short terms training programme (more than 20) as parallel approach to S&T communication have been developed. These training programmes are in the form of activity modules comprising some doable activities with the help of supplementary material in the forms of kits, posters, charts, observational /instructional sheets etc: to make the science more entertaining and enjoyable process through “participation-intensive approach.” These training models have been use to develop the sprit of inquiry and scientific attitude.

For example the training module “**Hydroponics-Fun with Plants in Soil less Condition**” is an activity based module developed specifically with the objective of increasing awareness among people in general and members of science clubs in particular, about plants as a primary producers and various factors affecting the living processes to understand the complex interrelationship of plants with other living and non-living components of the environment. This module has been designed to provide an opportunity to target group to improve their understanding and knowledge through the skill of observation, hands-on experiments, data collection, documentation and other important elements of method of science. The contents of module include information on different technique of hydroponics and methods of preparing different nutrient solutions, preparation of different decorative pots from used glass/plastic bottles, fused bulbs and tubes. A manual and a kit have also been developed as part of this module. During the training workshops, a number of new and innovative experiments have also been developed by the participants. Same have been included in the new edition of the manual which is now being translated into regional languages by the trained communicators and member of science clubs. .

Table-III: Training Modules based on parallel approach

1. Scientific Explanation of so-called Miracles.
2. Low cost science teaching/learning aids.
3. Understanding Mathematics through Origami.
4. Model Rocketry
5. Aeromodelling- the science of flight.
6. Detection of food adulteration
7. Exploring Nature.
8. Hydroponics-Fun with Plants in Soil less Condition
9. Usage of Folk Arts for S&T Communication.
10. Science Writing/Journalism/Illustrations.
11. Waste management through Vermicomposting
12. Life of Social Insects
13. Telescope making and Astronomical Activities
14. HAM Radio (Amateur Radio)
15. Use of PC for Scientific Experiments
16. Innovative Experiments in Physics.

Training programmes are also being organized throughout the country as per these modules for teaching community as a supplementary approach to science teaching besides training the resource persons, club coordinators, science communicators and activists. Till date more than 100,000 people have been trained through out the country. The popularity of these modules has proven the utility and efficacy of these modules as an important interactive model of science communication in India.

7.1 Important characteristic of training modules are

- Emphasis on methods of science rather than content
- To understand science as a process rather than a subject.
- A lot is left as do-it yourself mode for the imagination and improvisation of the target audience.
- Use of material familiar to participants and available locally and inexpensive.
- Present a topic embodying elements like spirit of enquiry, organizing, analyzing and applying the same in order to arrive at a solution or creating meaningful pattern leading to a systematic understanding of natural process or the understanding of their immediate environment & surroundings – physical & social, besides presenting an element of newness and freshness.
- Also extends support to formal and non-formal science education to the extent possible for children, neo- literate and other target group.

However, no formal pre & post studies have been done for the impact assessment. The difficulty is, if we were to find major difference in various parameters in the pre and post studies, we would not be able to attribute them solely to training programme. The reason is simple; the sample target group during same period also subjected to countless other influences at school at home, at work place or elsewhere. Apart from this complication, all the studies would probably cost much more than what cost to amount science popularization activities themselves (training programme). For this reason, only indirect methods are employed to assess the impact of training and other similar programmes. All indirect evidence suggests that our programme have had a positive impact among the audience we have attempted to reach.

8. Looking Ahead

The indigenous conceptual framework and parallel/alternative approaches as used in India is more suitable to a highly diverse society like India and more in tune with its social, economic, cultural and political milieu. This indigenous framework and approach of PCST will also be helpful in providing a new insight to the existing models used to assess the level of people's understanding of S&T in which awareness is confused with understanding. This can, to some extent, be attributed to the design and implementation strategies of traditional approach of science popularization which at best can help in creating scientific awareness, or disseminate information about science, technology, devices and gadgets. Practically this approach contribute very little towards making people temperamentally scientific in their approach or methodology of doing things or making choices out of given options or addressing problems or resolving issues. We are not suggesting that the activities based on traditional approach should not be taken at all. What is suggested is that, one may need to do things quit differently and go far beyond such activities, by integrating them with a whole lot of others in such a way that a large number of people would get involved in learning something new, innovative and different. This learning process would result in tangible/perceptible gains for the individual as well as society. These gains may be in terms of things like increased income, enhanced mental or intellectual satisfaction and a sense of achievement and enjoyment

Given the rich experience India has had in parallel and alternative approaches of PCST and given the overlapping concerns of Afro-Asian countries, the experience can be shared for crossbreeding and cross-fertilization of ideas for mutual benefits. The Indian experience would also help the mass media and other stakeholders to reorient and modify people's mental perception about science and what constitute S&T popularization/communication. In fact it is not out of place to mention that even in western countries the movement to promote "public understanding of Science" would benefit enormously by using the suggested conceptual framework and parallel approach either as it is or with suitable adaptations.

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