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OPINION

Science Communication in India: Policy Framework

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ABSTRACT

Science and technology in modern India cannot be discussed without referring to the discourse that is rooted in the debate initiated by the first Prime Minister of India, Pandit Jawaharlal Nehru (1947-1964). The science and technology policy documents that followed and articulated the vision of India, were Scientific Policy Resolution (SPR-1958), Technology Policy Statement (TPS-1983), Science and Technology Policy (STP-2003) and Science, Technology and Innovation Policy (STI-2013). These documents envisioned, articulated and codified aspirations, objectives and strategies to mark the role of science and technology in the nation building. The notion of 'scientific-temper', as proposed through the Indian constitution, has to be fostered relentlessly to keep the social ethos in sync with modern scientific knowledge. The policy frame-work of science and technology in India, enunciated from time to time has continuously empowered the stakeholders to intensify science popularisation.

KEYWORDS: Science and Technology, Policy Statements, Scientific Temper, Non-Governmental Organizations

Introduction

India adopted a policy on science through the Scientific Policy Resolution (SPR) in 1958, 11 years after winning its independence in 1947. SPR proposed *'to train enough science and technical manpower to fulfil the country's needs in science, education, agriculture, industry and defence'* (GOI, 1958:1). The country's political and scientific leadership decided to promote science and technology as a vehicle for the onward journey to progress. Pandit Nehru's commitment and faith in science and technology is expressed in his book *Discovery of India* wherein

he had expressed his belief in the capability of science in solving the problems of hunger, disease, illiteracy, superstitions, etc. He emerged the strongest votary of science in post-independent India.

Cultural Perspective

India, as an ancient civilisation, has a long history of the study of natural and celestial phenomena. Probing natural occurrences and scepticism is an integral part of the ancient Indian ethos. Evidence of the use of S&T goes back to the Harappan civilisation (Indus Valley) which had two well laid out cities Mohanjodaro and Harappa (both now in Pakistan) and the major Harappan sites in India which include Kalibangan and the port city of Lothal. This period dates back to about 5000-4500 years BP (Before Present) (Menon, 2007: 1-48). Nehru's references of Upnishads and Budha to give an Indian flavour to the concept of the scientific temper was to find resonance decades later in Amartya Sen's well-known book, *The Argumentative Indians*, where he demonstrates that the method of reason and reasoning, that the method of sceptical argument, that the acceptance of heterodoxy were, at various times, a defining characteristic of Indian civilisation (Jairam, 2011:7).

The contributions of Aryabhatta (476-550) in the form of a compendium of Mathematics and Astronomy (*Aryabhatiya*), covers Arithmetic, Algebra, Plane Trigonometry, and spherical Trigonometry. It also contains continued fractions, quadratic equations, sums-of-power-series and a table of sines. Brahmagupta (598-668) wrote the famous treatise *Brahmasphuta Siddhanta* containing 25 chapters on several unprecedented mathematical results and introduced the concept of 'ZERO'. Bhaskara-I (600-680) was the first to write the Hindu-Arabic decimal system with a circle for the 'ZERO' and made significant contributions to the study of fractions. During the medieval period, Bhaskara-II (1114-1185) was a pioneer in developing some of the principles of differential calculus and its application to astronomical problem computations.

The dawn of independence for India was a historical moment after almost 100 years of organised resistance, agitation and

struggle. During this period, India saw a revival and revitalisation of many social systems and the nation went through many waves of transformations. The concept of 'scientific temper' might have evolved during these upheavals within the Indian freedom movement and found its first mention in the, *Discovery of India* written by Pandit Jawaharlal Nehru in 1946. He was among the frontline modern leaders of the Indian National Congress during and after the freedom struggle.

Scientific Policy Resolution (SPR-1958)

The SPR, with the approval of the Parliament, was promulgated with the objective '*to foster, promote, and sustain, by all appropriate means, the cultivation of science, and scientific research in all its aspects — pure, applied and educational*'. The following assertion has a direct bearing on engagement of the common man which the resolution calls upon to '*….encourage individual initiative for acquisition and dissemination of knowledge….*' (GOI, 1958:1*).* The objective of dissemination of knowledge will certainly entail some engagement of people with science and technology. A minimum amount of knowledge, awareness and familiarity with science and technology is necessary for developing rational, logical and evidence-based conclusions of issues related to life. SPR was the first authentic document of the Indian Government to declare its intention to make S&T a prime vehicle of national development.

The implementation of SPR resulted in many scientific organisations such as Defence Research and Development Organisation (DRDO-1958), the Department of Space (DOS-1972), the Department of Electronics (DOE-1971), the Department of Science & Technology (DST-1971) and the Department of Environment (DOE-1980) (Aiyagary and Lavakare, 1981: 5).

S&T and scientific temper were considered so critical and important for India that it earned — a place in the Constitution of India Part IVA Fundamental Duties 51A.h, to '*develop scientific temper, humanism and the spirit of inquiry & reforms*' (Bedi *et. al.*, 2000: 72). It also got prominent place in all succeeding policy documents.

Technology Policy Statement (TPS-1983)

During the 1980s, strategic and front-running technologies became increasingly difficult to import. By now India had constructed a strong industrial and agricultural base and developed a qualified pool of scientific manpower. The Indian government, therefore, instituted a policy for '*attainment of technological self-reliance, a swift and tangible improvement in the conditions of weakest sections of the population and the speedy development of backward regions*' (GOI, 1983:1).

The Government of India promulgated its technology policy as the *Technology Policy Statement-1983*. It was a national vision document that recognised the role and importance of technology in the economic growth of the country. It should be noted that the policy statement was issued during a period of technology denial. Developed countries refused to transfer technology in key areas of economic development. Political independence without economic independence is a lame duck as was realised by the policy makers long back. The emphasis of the policy document was on self- reliance and strengthening the technology base.

This policy document emphasized the importance of technology communication to public and proclaimed '*... and also of those concerned, at all levels, with any sector of economic, scientific, or technological activity, and not least, the understanding and involvement of the entire Indian people. We look particularly to young people to bring a scientific attitude of mind to bear on all our problems*'. (GOI, 1983:3). It is obvious that 30 years ago India has aspired to engage the entire Indian population with science and technology in order to develop a scientific and technological temper to solve the problems of daily living. This was a clarion call for a change in the mindset of the people.

Science and Technology Policy (STP-2003)

India has already promulgated and implemented scientific policy and technology policy and by the beginning of new millennium-2000 it was felt to rationalise and amalgamate both- science and technology with a merged policy. The then Prime Minister Shri

Atal Bihari Vajpayee stated: "*We must take science to the people. All of us are fond of quoting Pandit Jawaharlal Nehru's famous words paying tribute to your community, namely, that 'scientists are in minority in league with the future'. This is true. But let us also remember that a bright future can be realised only when science is in league with majority of our society*" (MST, 2003:25-26). This was a reiteration of the necessity of social relevance of S&T.

The new S&T policy has an exclusive paragraph devoted to 'Public Awareness of Science and Technology' under strategy and implementation plan. The paragraph reads, "*There is growing need to enhance public awareness of the importance of science and technology in everyday life, and the direction where the science and technology is taking us. People must be able to consider the implications of emerging science and technology options in areas which impinge directly upon their lives, including the ethical and moral, legal, social and economic aspects. In recent years, advances in biotechnology and information technology have dramatically increased public interest in technology options in wide ranging areas. Scientific work and policies arising from these have to be highly transparent and widely understood.*

Support for wide dissemination of scientific knowledge, through the support of science museums, planetaria, botanical gardens and the like, will be enhanced.

Every effort will be made to convey to the young the excitement in scientific and technological advances and to instil the scientific temper in the population at large.

Special support will be provided for programmes that seek to popularise and promote science and 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 levels.

Closer interaction of those involved in the natural sciences and technology, social sciences, humanities and other scholarly pursuits will be facilitated to bring about mutual reinforcement, added value and impact" (GOI, 2003:25).

Science, Technology and Innovation Policy (STI-2013)

India has declared 2010-2020 the decade for Innovation. It became imperative to weave science, technology and innovation together '*since all three can operate, develop and function in separate spaces*' (GOI, 2013:2). Innovation in technologies can enhance economic and social development and understanding science of technology generally facilitates innovation. The STI policy is the next logical step in the policy domain.

The STI has also recognised the importance of engaging with people as the previous S&T policy documents have done. The new paradigm of the Indian STI enterprise is '*Science technology and innovation for the people*' under the paragraph '*Capturing Aspirations*' which emphasises the importance of the bond between science and society. '*Promoting the spread of scientific temper amongst all sections of the society*' is identified as a key element. It further adds '*Triggering changes in the mind-set and value systems to recognise, respect, and reward performances which create wealth from S&T derived knowledge*'. India has traditionally respected frugality, knowledge over wealth and wealth generating mechanisms. Knowledge has to be for universal good and need not necessarily be converted into wealth. In the modern IPR regime, to change this mind-set is a huge challenge.

The policy underscores the importance of public awareness of science by devoting a whole paragraph to communication of science and technology as reproduced below:

Public Awareness and Public Accountability of Indian STI Sector

"*Public understanding of science is an important dimension for introducing and reaching the benefits of modern science and technology to the people. The civilizational aspect of science, or scientific temper, needs to be promoted across all sections of the society systematically. Effective science communication methods by using tools such as National Knowledge Network will be initiated.*

Public and political understanding of science should be based on evidence and debates with open mind. People and

decision makers must be made aware of the implications of emerging technologies, including their ethical, social and economic dimensions" (GOI, 2013:15).

Thus, the STI has drawn the attention of the nation towards the scientific literacy of the common man and decision makers to ensure the delivery of the results of modern science and technology to the people.

Popularisation and Demonstration of S&T

India is a diverse and complex country with strong regional preferences including language. There are 22 recognised national languages. The urban and rural areas widely differ in infrastructure and facilities, posing challenges to S&T communication and popularisation.

The Central agencies such as National Council of Science and Technology Communication (NCSTC), Vigyan Prasar (VP), National Council of Science Museums (NCSM) and National Institute of Science Communication and Information Resources (NISCAIR) have played a pioneering role in science communication and popularisation. NCSTC launched multi-faceted programmes engaging with the public. NCSM mandated to conceive, establish and maintain museums, Vigyan Prasar is an expert body to generate communication resources and NISCAIR brings out periodicals, digital resources and generates quality manpower for science communication. The state councils and departments for science and technology have wide linkages with S&T based NGOs. The popularisation of S&T issues/topics are conceptualised by central agencies e.g. NCSTC, modules, resource materials, kits are produced by VP and major NGOs, and scientific content, formats, etc. are resourced from experts in NISCAIR and other relevant R&D organisations. Training to generate quality S&T communicators on specific and general S&T issues are organised by NCSTC, VP and NISCAIR at national and regional levels for personnel drawn from academic, media and NGO sectors, identified by State S&T councils/departments or selected directly by the organisers.

The NCSTC became functional in 1984 and launched a major out-reach field project, *Bharat Jan Vigyan Jatha* (BJVJ))

which was a massive engagement with people on S&T. People of all walks of life participated through five regional *Jathas* which converged at Bhopal (Madhya Pradesh) after 500 halts and walking 25,000 km. Regional languages were used for communication of the focal theme — self reliance and national integration through S&T. A similar exercise was carried out during 1992 — *Bharat Jan Gyan Vigyan Jatha* (BJGVJ), which became the precursor of the 'Indian Literacy Mission', launched and implemented by the Ministry of Human Resources Development.

The emerging electronic media in India was used to telecast 13 episodes on '*Bharat ki Chhap*' on television in 1989, encompassing the S&T contributions of the Indian sub-continent. The 'Evolution of Man' was a novel audio-serial, conceptualised and developed and broadcast in a 144-part serial from 80 radio stations in 18 regional languages by NCSTC.

In India there are many superstitions and myths surrounding celestial events such as solar eclipse. The occasion of total solar eclipses during 1995 and 1999 (an event of the century), (Kamble, 1999: 12-14), and the transit of Venus in 2004 and 2012 were used to explain the science behind these natural events. The whole nation was galvanised through TV, NGOs, State S&T Councils and school systems to use the occasion to bust the myths and sensitize people about astronomy. A number of communication materials such as solar filter kits, information brochures, booklets, greeting cards, wall charts and activity kits were distributed freely.

The NCSTC launched a mobile exhibition called 'Science-Express' in 2007, whereby a 16-coach AC train exhibited a 'tunnel of science' in collaboration with the Max Planck Society, Germany. It ran for four phases and is currently running as a 'Biodiversity Special' in collaboration with the India Ministry of Environment and Forests. It has a classroom for training of teachers in innovative pedagogy of science and a hands-on laboratory for kids. The train has run for seven rounds so far and has been visited by more than 10 million visitors.

National level celebrations are used as a means of taking people along in S&T popularisation. The awareness about

science has been generated by celebrating the Year of Scientific Awareness (YSA) 2004, World Year of Physics, Year of Chemistry 2011 and the Year of Mathematics 2012. These events enjoy the collaboration of S&T organisations at state level and enrol various NGOs to participate across the country.

There is a huge network of S&T based NGOs spread all over the country and they actively participate in field projects such as exhibitions, low-cost and no-cost teaching aids, *Jathas*, spreading S&T awareness through cultural means such as street plays, drama, community radio, etc. Some of the big and experienced NGOs such as Kerala Shashtra Sahitya Parishad (KSSP), Eklavya and others, are capable of producing teaching materials and science popularisation kits and implement the national agenda of S&T popularisation for fostering scientific temper. National Children Science Congress (NCSC) is a unique experiment to popularise the method of science amongst the children in formal school system and informal school system, in the age group of 10-17 years, through research projects around a focal scientific theme, relevant to their immediate environment. The programme enrols around a million students, thousands of teachers and parents each year.

A long term research project to assess the public understanding of science, due to above efforts or otherwise, is being carried out for the past 20 years in Kumbh and Ardh Kumbh Mela — a religio-cultural huge congregation — at Allahabad, to understand and gauge the public understanding of science (Gauhar *et. al.*, 2002: 293-308).

Science communication is comparatively a younger field in India and is still striving to carve out its rightful place in the domain of science. Governmental and Non-Governmental agencies are working to communicate Science and Technology to the masses, and to foster scientific and technological temper among people so that they are empowered to take considered decisions in day to day life or on issues of national importance.

Conclusion

India is an ancient civilisation with a strong legacy of intellectual pursuits, a keen observation and an intense endeavour to find

acceptable explanations for natural phenomena. Discussion, consultation and openness to diverse views have been the hallmark of the Indian social ethos. The contributions of ancient India in the field of mathematics, architecture, astronomy, natural philosophy and health have been impressive but the generation, utilisation and propagation, if any, remained exclusive and elite in character, debarring participation of common man. Our social construct was also responsible for aloofness of S&T endeavours since it was supposed to be an elite activity for the pristine pleasure of knowledge — not necessarily for social application.

India decided, after independence, to make science and technology an integral part of its development strategy. The Indian Parliament endorsed a Scientific Policy Resolution, as early as in 1958, articulating the vision and aspiration of the nation. Engagement of the common man with S&T was considered a necessary part of this strategy. The S&T communication, popularisation and fostering of a scientific temper among the masses and decision makers has been emphasised again and again through the policy instruments promulgated during 1958, 1983, 2003 and 2013. Each document has amply emphasised the importance of science popularisation. Government and non-governmental organisations have played and are still playing a vital role in fostering the scientific spirits in the country.

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