Policy Paper 1

Science Communication Policy: Focus Karnataka

"It shall be the duty of every citizen of India to develop scientific temper, humanism, and the spirit of inquiry and reform"

Article 51 A(h) of the Constitution

Prepared by

Institute of Frontier Science and Application (IFSA)
www.siid-ifsa.org

Karnataka Science and Technology Academy
(Department of Science & Technology, Govt. of Karnataka)
&
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The Organizers: Brief Profiles

Karnataka Science and Technology Academy (KSTA)

Karnataka Science and Technology Academy (KSTA) is an autonomous organisation under the Department of Science and Technology, Govt. of Karnataka, established under the Chairmanship of Late Prof. U. R. Rao, Former Chairman, Indian Space Research Organization & Secretary, DOS, Govt. of India in July, 2005. The Academy, with the objectives of inculcating scientific temper across civil society, facilitating technology dissemination, fostering innovations & entrepreneurship for societal benefits, recognising talents & contributions through awards, acting as a resource centre for capacity building in frontier areas of science & technology and serving as a Policy Advisory Body for the State, is presently functioning with Prof. S. Ayyappan, Former Secretary, DARE, Govt. of India & Director, General, ICAR, New Delhi, as the Chairman.

KSTA, since its inception, has been organizing a bouquet of educational and outreach programs across the State of Karnataka, providing a platform for empowering and enriching teaching and learning at different levels, as well as developing a spirit of inquiry and scientific temper among students. In addition, the endeavour of KSTA is to develop a knowledge-based society through popularization of scientific developments and advancements among general public in Karnataka.

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The traditional boundaries of science are not only irrelevant but are limitations today. Similarly, the conventional institutional structure with fixed departments is limiting factor in today's dynamic world of science. The Institute of Frontier Research and Application is a virtual institute that leverages the emerging Information Technology tools and an international network of scientists, experts and thought leaders. IFSA maintains a fluid structure, enabling formation of research groups around identified problems from a network. IFSA is also dedicated to provide an exploratory platform for cutting edge research, taking it full circle to the extreme end-users. IFSA works with the motto: “Knowledge without Boundaries.” IFSA aims to develop a research and application platform for path breaking and innovative research and products, with the goal of playing a catalytic role in frontier research, innovation and application.

IFSA is a unit of Science for Inclusive and Integrated Development (SIID), a public interest charitable Trust registered in Karnataka. It is headed by a Chairman. working as a common pool from which suitable teams can form to address specific R&D problem. The programmes and the activities of IFSA are guided by an Advisory Council of eminent scientists and thought leaders

Current Chairman: Prof. Prashant Goswami
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Foreword by the Organizers

With the advancements in the field of science and technology together with the rising concern over socioeconomic growth, the importance of effective science communication needs no emphasis. The fast evolving technologically entwined global society has now accentuated the necessity to develop a mutually understanding dialogic environment between the science practitioners, policy makers and the public in every country. At a time when science, technology and innovations have become central to every economic activity, from food to health, service to industry, translation and communication have become equally important. With an explosion of scientific literature, it has become imminent to build an societal ecosystem, that can appreciate and assimilate both information and knowledge.

There is also an increasing number of players in the value chain of application of S-T-I tools, from technology generation to validation to application, scale up and commercialisation. These stakeholders come from different backgrounds, with varied sets of beliefs and practices, who need to be conveyed the concepts, proofs and potentials of new sciences. At the same time, it is important to appreciate the logics behind time tested processes and practices, without blindly rejecting them. There is a need for interfacing the lab science with citizen science, with a sense of ownership.

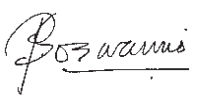
Science communication can help science and a scientific culture penetrate India's socio-culturally diverse society, and to transform it into a nation of scientifically thinking and scientifically aware people. With unprecedented technology revolution in electronic, print and social media, it is an opportune time to address the science communication in all its dimensions. It also needs a regional focus, as each state has unique problems and challenges.

The Policy document was developed through an inclusive participation, with starting with inputs and feedback from many members (Annex 3), starting with a broad contour, then a Zero Order Draft (ZOD) leading to a First Order Draft (FOD) and finally the final version through a Discussion Meeting held on 14th October, 2020 (Annex 1). At each stage, there had been very active and valuable participation by the invited participants. It is our great pleasure and privilege to acknowledge and thank each and every member of the panel.

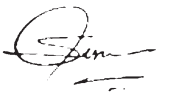
We are grateful to Dr Ashwath Narayan, C.N., Hon'ble Deputy Chief Minister and Minister for Higher Education, Electronics, IT, BT, Science & Technology, Skill Development, Entrepreneurship & Livelihood Departments, Government of Karnataka; and Dr E.V. Ramana Reddy, IAS, Additional Chief Secretary to the Hon'ble Chief Minister and Departments of Electronics, IT, BT, Science & Technology, Government of Karnataka, for their interest and guidance in the conduct of the programmes of the Karnataka Science and Technology Academy. We also thank the Members of the KSTA Executive Committee for their participation and valuable insights and inputs, that have enabled formulation of the Policy Paper. Thanks are due to the functionaries of the Karnataka Science and Technology Academy, Bengaluru for their coordination efforts.

Institute of Frontier Science and Application would like to thank the members of its Advisory Council chaired by Prof. Ashoka Chandra and its Senior Associates for their contribution and participation.

We hope this paper would pave the Way Forward for enhanced Science Communication in the State, as also serve as a reference at the national level.



(Prashant Goswami)
Chairman, IFSA



(S. Ayyappan)
Chairman, KSTA

November 1, 2020

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Summary for Policy Makers

Preamble: Effective science communication is critical for the last-mile connectivity between science and the beneficiaries, the society at large. Essentially, success of all developmental schemes like Swachcha Bharat, Swastha Bharat, Atmanirbhar Bharat, Lab to land and Samarth Bharat depend crucially on effective science communication to different sections of the population.

However, while literacy levels are increasing (currently at more than 74%, with Karnataka slightly ahead at about 76% of the population), scientific literacy is still quite low. Effective science communication is critical to improve science literacy, and to accelerate development of a knowledge society through eradication of superstitions and blind beliefs, leading to better adaptation of science and technology and ease of implementation of science-based interventions.

At the same time, there is a growing demand for science information among different groups of clients, and that in the absence of authentic information, there is a natural tendency to adopt even non-scientific or pseudo-scientific narrations/explanations.

Karnataka Science and Technology Academy (KSTA), in association with the Institute of Frontier Science and Application (IFSA), has taken an initiative to develop a Policy Paper with the vision of Development of an Implementable and Inclusive Science Communication Policy for infusion of science and scientific temper in all walks of life and for all social strata.While most issues in science communication in India are generic, there are also several regional issues. The document provides specific recommendations with focus on Karnataka.

With a broad and inclusive participation of many experts, communicators and thought leaders, the Policy Document was developed starting with defining the contours to a Zero Order Draft and then to a First Order Draft, with comments and suggestions at each stage. The Document was finalized though interactive Video Conferencing on 14th October, 2020.

The document considers the relevance and potential impacts of science communication and discusses the critical issues and the challenges involved along with a SWOT (Strength, Weakness, Opportunities and Threats) analysis. The broad

goal of the initiative is to develop a policy for effective science communication with special emphasis on the policy being effective, inclusive, implementable, socially non-disruptive and sustainable, with focus on Karnataka.The following major conclusions emerged:

- Science communication can play critical to enabling roles in regional and national development
- There is growing demand for science information; people are willing to pay for such information
- In the absence of authentic science information people fall prey to misinformation, and bad practices
- There is a lack of quality data on science literacy in India, and in Karnataka in particular.
- There is no mechanism to ensure quality and authenticity of science information from various sources.

Based on the above conclusions, the following major recommendation are presented:

1. Establishment of an agency for systematic, sustained and structured approach to science communication, which will act as an authentication gateway for information to the clients.
2. Mapping of science literacy and science information demand through inclusive surveys.
3. Development of a complete science communication ecosystem with focus on Karnataka
4. Adopt science communication as an Information Service on Demand (ISoD) in a financially self-sustainable manner, through a Service Provider with clear responsibilities.
5. Adopt clearly defined outcome and measurable targets for effective review and monitoring

Definitions

Science Communication cannot be discussed without use of certain terminology.many of these terms are often used with subjective understanding or interpretation. To ensure an unambiguous discussion, the following definitions/narrations are adopted in this document

Science: In our description science is a way of acquiring and building up a body of knowledge based on the primary principles of objectivity, consistency, verifiability and reproducibility. Thus, by science we do not mean a particular school of science (like western, modern or traditional); any pursuit of knowledge, and findings thereof that meet the above principles will be considered science.

Scientific Methods: Scientific method can be said to be embodied in the golden quadrangle: observation-experiment-theory or validation/explanation. This implies a healthy combination of faith in time-tested theories and a skepticism about their validity/limitations**.** However, mere mastery of a scientific method does not imply scientific attitude.

Observations/Evidence: The basis of science can be said to be observations. In any consideration regarding acceptance, robust observation is in the first place. However, the nature of observation and evidence have changed greatly over the ages. Beginning with bare sense observations, science now relies on extremely complex instruments and facilities to probe the macro cosmos of the stars and the galaxies and the micro cosmos of quantum physics. The uncertainties involved increase accordingly.

Theory/Model: All basic human understanding of the physical reality is based on a basic cognitive model shared by most humans. However, as the probing becomes complex, dependent on instruments and probes not directly controlled by sense perception,

Superstition: A superstition or a blind belief is one that is followed in spite of irrefutable evidence to the contrary, or without any observational evidence or rational explanation. It should be noted that lack of an explanation does not make a robust observation a blind belief; however, attributing such an observation directly to a super-natural cause avoiding enquiry is considered a blind belief.

Scientific Temperament: Scientific Temperament or attitude is not limited to practice of science but refers to a way as to how to look at and examine information to develop and interpret science. It emphasizes rational, evidence-based thinking.

Hypothesis: Any scientific theory has underlying hypothesis and assumptions andvalidity of a scientific theory is only within the framework of these assumptions. Science often begins with a hypothesis; however, a hypothesis is not science until it has met the defining principles of science.

Validation: Many scientific theories/models are statistical in nature. Thus, cconclusions may change when the sample is changed due to more inclusive surveys, change of location, frequency etc.

Extrapolatory Conclusions: Many feel often tempted to draw conclusions beyond what is implied by a scientific investigation. Such extrapolations are not science until verified.

Vision, Goal, Objectives and Background

Vision: Inclusive Science Literacy and Science Communication for development of a knowledge society through infusion of science and scientific temper in all walks of life.

Broad Goal: To develop policy and implementable action plan for effective science communication to build and instill scientific temper and foster a spirit of scientific enquiry, with focus on Karnataka.

Specific Objectives: The specific objectives are to develop effective science communication to

(a) Enhance science literacy at all levels in measurable terms

(b) Replace irrational and blind beliefs with authentic and well-articulated scientific explanation

(c) To create a scientific environment right at the grassroots level.

Background: With the advancements in the field of science and technology together with the rising concern over socioeconomic growth, the importance of effective science communication has increased. The fast evolving technologically entwined global society has now accentuated the necessity to develop a mutually understanding dialogic environment between the science practitioners, policy makers and the public in every country. At a time when from health industry to commercial sector, and communication networking to food production, every aspect of national base depends on the development of science and technology, the necessity of effective communication between the science community and the users of their application, to reduce knowledge gap and strengthen development strategy, has increased.

India has an impressive scientific heritage. However, a large gap has persisted between this scientific knowledge and the 'common' person. While there had been some attempts, a systematic and critical effort to take science to the people is still absent. The principle of 'scientific temper' - an enquiring attitude and analytical approach that leads to rational thinking and the pursuit of truth without prejudice was enshrined in the constitution of India, with a special provision.However, most Indian states still suffer from blind beliefs and inappropriate practices and a reluctance to adopt scientific solutions. An effective and comprehensive science communication policy can play a critical role.

Although much has been achieved in India, there is still an urgent need to make science communication more effective, both in terms of quality and quantity. There still exist superstitions and blind beliefs leading to bad practices; the general public is still largely ignorant about common scientific principles. An effective science communication policy is vital to remedy these shortcomings

Evolution of the Policy Document: Following the invitation by KSTA to develop the policy document, IFSA, in coordination with KSTA identified and invited experts and thought leaders with diverse background (Annexure 3) for inputs and participation. A Broad Contour of the document was first circulated and then a Zero Order Draft (ZOD) was developed and circulated. The comments and feedback received on the ZOD were incorporated in the First Order Draft (FOD). A large degree of convergence on a number of topics has been achieved through feedback on the ZOD and the FOD. The final version was created based on further deliberations on the FOD presented by Dr Prashant Goswami in a Discussion Meeting on 14th October, 2020 (Annexure 1).

Science Communication: National and International Status

India recognized the importance of science communication quite early, and the National Council for Science and Technology Communication (NCSTC), Government of India was founded in 1982 with the goals of

- popularization of science,
- dissemination of scientific knowledge
- inculcation of scientific temper.

An All India People's Science Network was created in the late 1980s, with 27 constituent voluntary organisations. The NCSTC Network started in 1991 with the objective of taking science popularisation activities to all the corners of the country. NCSTC had also started a countrywide project to compile information on science communication software, hardware, 'humanware' and agencies to facilitate further networking. Efforts to organise science writers and improve science communication were taken up many states; in Maharashtra, Karnataka, Tamil Nadu, West Bengal and Assam, science writers' associations were involved in publishing popular science books and journals. At institutional level, a group was created in CSIR National Institute for Science Technology and Development Studies (CSIR NISTADS) with the objective to carry out research on Public Attitudes and Understanding of Science (PAUS).

There have been also other efforts, like a publication by the National Institute of Advanced Studies (NIAS, Bangalore) in 2014 and a workshop titled “Science, Journalism, Media: Communicating Science in a Changing India” **j**ournalism in India, jointly organized by the Institute of Mathematical Sciences, Chennai, and the Indian Academy of Sciences on August 20-21, 2018, in Chennai. While these efforts highlight many important issues in science communication and science journalism there is need

for systematic, critical and sustained efforts in science communication. Recent surveys by Pew research centre (Ratings of medical treatments, scientific achievements and STEM education in India, September, 2020: https://www.pewresearch.org/ science/ fact-sheet/public-views-about-science-in-india/) provide important insights into the public perception of science in India. Similar quantitative surveys on scientific attitude would facilitate evidence-based formulation of science communication policy in India. Currently agencies like Vigyan Prasar (DST) and CSIR are actively involved in science communication in India'; other agencies have also initiated more activities in science communication and outreach. *What is missing is a science information service on demand.*

Globally, science communication has been both a subject of government policy and academic research. The topics of investigation involve science literacy at different levels, scientific attitude, public perception of science and sustainable learning skills. The importance of science literacy for all countries was emphasized as early as 1975 (American Scientist 63: 265-268, 1975). The 2015 International conference "Education, Reflection, Development", ERD, 3-4 July 2015, Cluj-Napoca, Romania discussed in detail the Scientific Literacy in Schoolto determine the level of teachers attitudes with regard to the scientific literacy. It was emphasized that to achieve sustainable improvements in scientific literacy, it is crucial for teachers to develop their own positive attitude toward science. An important observation is that the formation and development of learning skills lifelong is necessary to ensure the ability to educate regarding to the new scientific developments. An interesting finding is that individuals with greater science literacy and education have more polarized beliefs on controversial science topics (2017: PNAS: 114 (36) 9587-9592). Understanding the educational reality facilitates the actions, with clearly defined strategies, for strengthening the skills of scientific knowledge

Potential Impacts of Science Communication

Science communication can help science and a scientific culture penetrate India's socio-culturally diverse society, and to transform it into a nation of scientifically thinking and scientifically aware people. However, it also needs a regional focus, as each state has unique problems and challenges.

The goal of building scientific temper includes developing an attitude of logical and rational thinking inculcating in every citizen to create the habit of coming to conclusions and making decisions based on evidence, reason and logic, and thinking and acting in a manner that uses the scientific method of observing, questioning, testing, analysing, along with honest and accurate communicating! A scientific temper can rid the society of blind beliefs, inappropriate cultural practices, resistance to desirable S&T interventions, adherence to pseudo-sciences, and fear of new S&T Developments.

Effective Science communication is both enabling and critical for many areas; hence the science communication policy needs to be comprehensive. Available literature focusing on opinion surveys conducted in the west showed that people, irrespective of their nationality, socio economic conditions or cultural backgrounds, are deeply interested in developments in the fields of health and hygiene (Durant 1991; Brike 1990; Durant 1992; Raza 1991). Science Communication is the primary means to achieve these goals.

Science Communication for a Knowledge Society: A wider acceptance of scientific ideas in the society is a necessary precondition for achieving the goal of a knowledge society. Phrases such as 'scientific temper' 'broad scientific outlook', 'scientific belief system' and 'scientific method' have to be made the way of life through science communication. Excellent science communication can capture the imagination: sparking meaningful debate and discussion that grants science a stronger presence in our society. Science communication can, through propagation of scientific ideas, be an instrument for raising the consciousness of the people; it can also prepare the younger generations for a knowledge society. Science Communication can also help promote positive, socially and culturally supportive action for environmental protection.

Science Communication for Societal Development: One of the greatest challenges for many Indian states, and Karnataka in particular, is still prevailing superstitions, blind beliefs and inappropriate practices. Effective science communication can, on one hand, provide convincing, rational arguments against such practices. On the other hand, efficient science communication can strengthen initiatives like Swasth Bharat through more widespread and proper practices of science-based solutions/practices.

Science Communication and Technology Diffusion/Adaptation: While science and technology are bringing new solutions in many areas like agriculture, healthcare and energy, acceptance of these solutions require some basic understanding of science in these technologies. Science communication can provide such understanding, thus making **Lab to land** more efficient**.**

There is often a lag between the availability of a science/technology solution and its acceptance/practice by the people. Science communication can remedy this problem by providing a stronger understanding.

Science Communication and Atmanirbhar Bharat: Unless the whole population, or at least a very sizable fraction of the people, embrace science as a way of life, the potential benefits offered by science in various areas, from education to healthcare to environmental protection, cannot be realized. For a truly self-reliant India,

scientific practices should become way of life rather than through laws and regulations. Only effective science communication can achieve this goal.

Science Communication and Swacha Bharat: The dream of a clean India can be realized only through people's participation at all levels. Once again, only a pervasive scientific attitude and science literacy can make such people's involvement possible.

Science Communication and Swastha Bharat: It is well known that many health hazards in India are due to unhealthy practices. However, while the government is constantly trying to create awareness of good practices like washing hands, a true revolution leading to a healthy India can only come from a transformative change of the people to scientific thinking.

Science Communication and Samarth Bharat: A primary route for socio-economic advancement today is through science and technology innovations.

Science Communication and Industry: However, science communication is not yet seen as important an activity as engaging in science per se in industries. However, for science and technology-based industries, efficient science communication is a vital requirement.

Science Communication and Digital India: While the digital technologies brought in a quiet revolution, the complexities of these technologies, and the related vulnerabilities are also going to grow. Familiarization of these technologies through science communication would make critical contribution to developing an inclusive digital India and prevent any digital divide.

Science Communication and Inclusive Development: With the growing roles of science and technology across all strata of the society, inclusive development cannot happen unless a certain degree of science literacy pervades all echelons of the society.

Science Communication and Lab to Land: Having developed a scientific or technological product, the success of the product in reaching market depends critically on communicating the qualities of the product to prospective industrialists and innovators in communicative terms, This requires a certain amount of science literacy on both sides; the lab and the prospective industry.

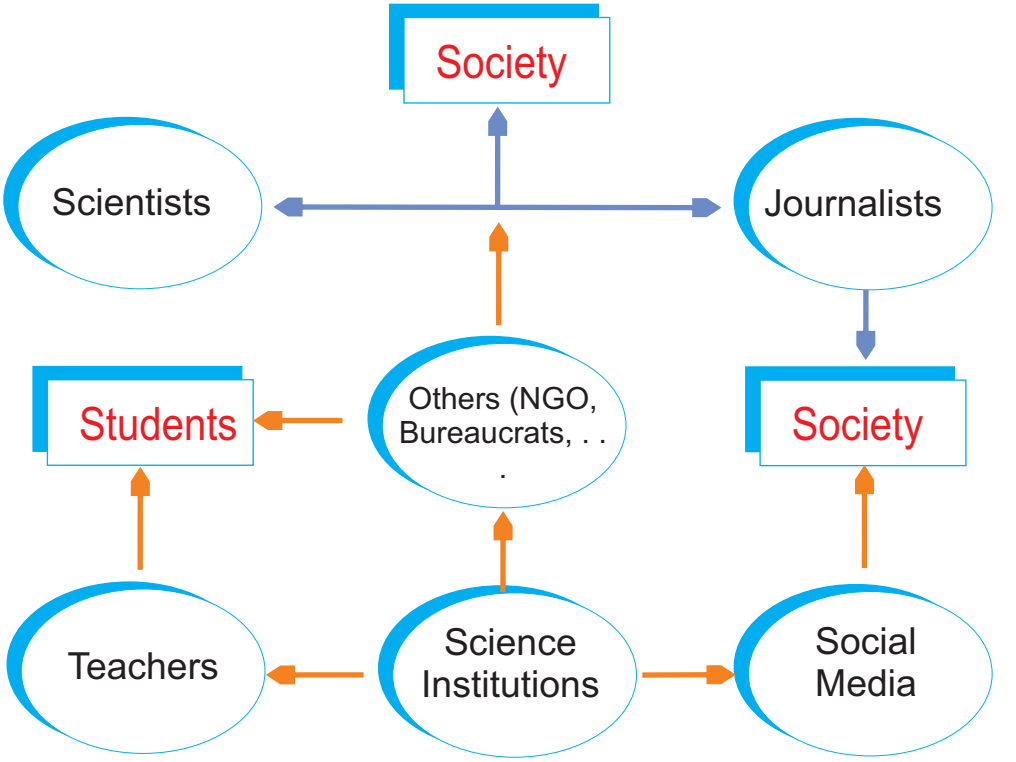
Science Communication and Excellence in Science: Any scientific or technology work has to be finally accepted through communication. Clearly efficient science communication is vital for this process. However, in spite of a wide pool of talents in India, and in Karnataka in particular, India's position in the world in science is still not up to expectation. Proper communication skill in science can significantly improve this situation. International experience suggests that Communicators impact the fortunes of organizations even more than those who are domain cantered.

There are many other areas where science literacy and science communication can directly or indirectly impact a nation's growth. As science and technology become more intertwined with people's lives, the role of science literacy and science communication will only increase.

Critical Issues in Science Communication

It is only in the absence of sufficiently broad and accessible scientific knowledge base that the populaces falls back on extra-scientific structures of thinking for seeking explanations of natural phenomena and hence, they cannot be categorized as mythical or superstitious.

The Science Communication Ecosystem: It needs to be emphasized that effective science communication requires a complete ecosystem, with each of the links sufficiently strong.



A Schematic Representation of a Science Communication Ecosystem

The major components of this eco-system, the scientists, the science teachers, the science journalists, the institutional science correspondents and the others like Non-Governmental Organizations and the Bureaucrats are well recognized. However, there are also many micro-components that are equally important. An important emerging component is the social media, including WhatsApp. Unless all these components are well connected and harmonious, effective science communication is unlikely to take place.

Content and Focus: Science and Technology, though conceptually separable, are intricately intertwined in real life. Technological products are easy to observe object and demonstrate. However, a true achievement would be to communicate the science in the technology, so that it gets assimilated to the society's knowledge complex. This runs the risk of creating the impression of technology as panacea for every problem, leading to blind, unquestioning belief in technology, creating the very anti-thesis of Scientific Temper!

Communication Policy: The most challenging aspect of science communication is getting the audience interested. Even the "science" itself may discourage many readers who consider scientific texts as difficult to read. Besides, many such texts sound unnatural due to translation. Thus a careful policy is needed to design what should be communicated, and an enabling mechanism to create such contents.

The communicators of science form a critical component of science communication. While the content should be accurate and relevant, it must also overcome the barriers of obscurity and being assertive statements. If multiple communicators are envisaged and two- sided communication, we need to identify who these are and how their communication efforts should be provided policy support.

Immediacy Factor: General public, and to some extent, students and policy makers, naturally focus on issues that are of immediate interest to them. Naturally, issues with high degree of immediacy, like a disease or a drought or a natural disaster, are important occasions to communicate the proper science behind these issues. The science communication policy should dynamically address this issue by determining subject, content and the intensity of communication

Scientific Explanations: The factors inherent within the scientific knowledge system, such as complexity involved in explaining the phenomenon, duration of its life cycle, the control that an individual or a collective can exercise, and the intensity with which the phenomenon could influence the life of common citizens, are the most important *factor that determine cultural distanceof a science topic*. For example, the extent of mathematical obscurity and conceptual complexity involved in the explanation

of a phenomenon will be inversely proportional to its pace of its propagation (Raza *et al.* 1996). It is when this happens that a common citizen is likely to invoke intuitive, cultural, or even religious explanations when confronted with a complex natural phenomenon (Raza *et al.* 1991). (Durant and Bauer 1992).

In answering peoples queries on scientific subjects, there are at least three categories of explanations:

(a) Mystical or Supernatural Explanation: Invokes unexplainable forces or factors basedon beliefs

(b) Those that do not invoke supernatural powers but are scientifically incorrect; the number of such responses is likely to increase as the complexity of the phenomena.

(c) Intuitive explanations: Explanations borne out of reluctance to admit ignorance by an assumed authority

(d) Correct but technically uncommunicative answers: A common problem with many science communicators who knowingly or unknowingly clutter the communication with jargons.

(e) Correct answers in language and terminology understood by the audience: This is the most useful but the most rare, and perhaps the most difficult.

Obviously, the goal of an effective science communication policy is to ensure explanations that are correct in language and terminology understood by different audience

Receptivity and Retention: The receptivity and retention of scientific information within peoples' structure of thought, reduces as the distance of a scientific area, phenomena or experiential episode, from their quotidian life increases. Effective science communication policy needs to take cognition of this and provide solution.

There is evidence that the varied pace of incursion of modern technologies in peoples' quotidian life is reflected in their structures of thinking. Migration of people from villages to small towns and metropolitan cities where they encounter a different cultural, technological and environmental locale resulting in a shift in their concerns and curiosity has corroded the traditional (Shils 1981) cultural and experiential knowledge base.

Serious concerted efforts have to be made in order to fill the cognitive gap in the societies that are in transition by approaching the people through mass movements and other mediums. If science agencies and activists don't map out strategies directed

towards plugging the holes, in the cognitive structure of the masses, through proper science communication, superstition and blind beliefs are likely to occupy the vacant spaces.

Role of science journalism: The vast majority of knowledge generated by scientific research worldwide and in India rarely finds its way into public understanding or appreciation. A strengthening of the foundations of science journalism and science communication can bridge this gap between scientists and the society at large.

Medium: In the latter half of the fifties a large number of new books for teaching science in regional languages were written. However, translating English texts posed two major problems, one that Indian languages culturally had a limited capability of expressing modern scientific ideas and secondly, there is an acute shortage of standard technical terms. These terms had to be coined, at times this was done mechanically and at others, recourse was taken to using familiar but inaccurate terms leading to obfuscation. For science outreach in Indian languages, it is important to understand that text as a medium of communication is not as relevant any more. It can, at best, be a preparatory step. Blogs, newspapers, magazines etc. are not impactful as a well-made video or audio. However, this has to be context specific depending upon the audience for an inclusive process.

Institutional Arrangements: Implementation of effective science communication would require sustained and critical effort. This requires an appropriate structure for implementation. New structures may have to be set up, existing ones augmented and strengthened, or external existing arrangements co-opted (for example, Vigyan Prasar).

However, today a science communicator cannot be just a writer, but should be a multimedia person, able to use all three modes – text, video and audio in synergy, and if possible, even venture towards non-traditional modes such as performing arts and illustrations. A concerted, systemic effort is needed to meet this requirement.

It is also quite common to tend to enshrine science and present a picture of science as a flawless, absolute truth. While concepts like falsifiability may be difficult (and may not be always strictly necessary) to communicate to a layman, it is important to communicate that science is an evolving knowledge structure, not a monolith and has its share of errors and uncertainties.

Challenges in Science Communication

While literacy levels are increasing (currently at more than 74%, with Karnataka at about 76% of the population), scientific literacy is still quite low. Given India's large population, limited resources and multitude of languages, mass science education faces particularly great challenges.

Regional (Karnataka) Focus: If science communication has to penetrate into all levels of the society, what is required is not just translations, but original content created in the regional languages by people with a clear understanding of both the science and the nuances of the language.

Content Generation: Resource Development and Training: Effective science communication against irrational beliefs, non-scientific explanations and pseudoscientific-theory should be based on logic and evidence as well as scientific methods, and not mere assertions nor based on the scientists' position of authority. This requires an organized and sustained effort, which is missing.

Maintaining Dynamism: Science is a dynamic topic. Old ideas are constantly challenged and refined, while new ideas enter. Thus, the society needs to be made aware of new scientific knowledge that is being generated on a daily basis. Once again, the issue is choosing the scientific information to be communicated from amongst the many developments for their significance.

Human Resource: A critical success factor for an effective science communication system is an adequate number of qualified science communicators. However, there is no systematic mechanism for developing and retaining trained science communicators.

Science-Religion Conflict: For our multi-religious society, it is important to carefully articulate that science is not against religion. The emphasis should be on pseudo-science and misinformation and over dependence or over reliance on any printed/electronic information.

Scientist-Public Divide: The word 'scientific', is often perceived by general public as technical, 'for elites' or even irrelevant. The notion of science as a way of life needs to be communicated. A particular challenge is overuse of jargon and avoidable technical terms by the communicators.

Understanding Client Needs: For science communication to succeed as a service, the product must be what client needs rather than (only) what a communicator wants. However, there has been virtually no effort in identifying such client needs and product design.

Scientist-Scientist Divide: It is common for scientists to have diverse opinions on most scientific topics, causation of phenomena and interpretation of immediacy or impact; the current Covid pandemic is a good example. Such diversity of opinion, however, creates a great deal of confusion among the public, leading to general erosion of confidence in science itself.

The Scientist-Journalist Divide: Science is often a process instead of a finished product. Scientists stress on ensuring accuracy in the reporting based on the current knowledge. The journalists, on the other hand, would like the story to be easily understood with a great degree of immediacy, clarity and impact. Greater media focus is given to its speed of dissemination to the public and ease of digestion, often to the harm of more traditional information values such as quality and reliability of source. This often creates a conflict between the two narrations, and creates confusion among general public.

Public Perception of Science: There is very little research on public understanding of science, even though theories abound about the same. An issue is of representation and stereotyping when science stories are reported in the media. Scientists are often seen as experts on a broad range of subjects which they may not have specialized in; this often exacerbates the imposter syndrome that they feel.

Communicating Uncertainties: Uncertainty is implicit in science. Researchers know experiments rarely provide more than a narrow snapshot of reality and all results are subject to interpretation through probability and prior assumption. However, those unaware of this uncertainty can react to these articles with misplaced hope, unnecessary alarm or indifference, no longer trusting the contradictory, unhelpful claims that scientists so often seem to make.

Trust Deficit among scientists and communicators: A basic “trust deficit” exists between these two communities. The trust deficit spills over and creates confusion among people.

Rural-Urban Divide: Data reveals that the degree of access to modern education and occupation are important determinants of a respondent's scientific awareness and perception. In a predominantly agrarian environment such as that of small towns, despite a shift in professional careers, socialisation in modern education reinforces the already broad knowledge base in scientific disciplines that are closer to peoples' daily life. This is not true for urban environments where despite high levels of exposure to education peoples' awareness about some daily phenomena may be comparatively low.

Evidence Based Approach: In a country like India, it is quite difficult, time consuming and expensive to carry out a public opinion surveys. Collecting a

representative sample is not an easy task. Surveys through post or through telephone cannot be conducted as is done in most developed countries. In any case this methodology excludes illiterate population out of the universe; interview schedules are still the most suitable method available to social scientists.

Inclusivity: It is important that science communication policy is inclusive in addressing the needs of different strata of clients, and future oriented. There is need, for example, to communicate the nebulous yet promising frontier areas of science in an interesting and appealing.

Science Communication in Digital Edge: It is natural and observed that the younger generation is more comfortable with various newer technologies of communication, while the relatively older generation of communicators is not. This itself creates a divide and a perception. Thus any Science Communication effort to be successful, concerted and systemic efforts are needed to adapt and integrate new Science Communication Technologies and drive Innovation in science communication.

Science Communication in Digital Age: Rapid growth in digital technologies are bringing new dimensions to science communication. This requires greater penetration of digital literacy to various strata of the society as well as orientation of science communication to digital medium.

In spite of many existing and emerging challenges in science communication, it calls for a strong and systematic initiative.

A SWOT (Strength. Weakness, Opportunities, Threats) Analysis Focus on Karnataka

Strength: Karnataka in general, and Bengaluru in particular, has a wide variety of scientific institutions covering essentially all areas of science and technology. Scientists from many of these institutions have settled in Karnataka, or are available. As a whole, Karnataka is high on IT literacy making it feasible to use modern audio-visual technologies for communication/dissemination.

Weaknesses: There are declining trends in science communication in Kannada. Many science communication efforts, *'Janapriya Vijnana'* by Bangalore University and popular science program *'Vismaya Vijnana'* by the Bangalore Doordarshan, have disappeared. Out of about 40 Kannada channels none seems to have any slot for Science programme in Kannada; Only All India Radio, Bangalore still has a science programmes in Kannada.

Opportunities: With the enhancements in digital technologies, and growing popularity of remote learning, there is an opportunity to harness the distributed expertise and create an effective science communication platform

Dissemination of information through social media, especially on services like WhatsApp is not only rapid but also provide an opportunity to interact directly with the audience.

There is also a growing appreciation of need of science information by public. At the time of crisis like the Covid 19 pandemic, relevant and authentic science information is a valid commodity. This makes authentic, validated science information an important product

The tools to produce good quality audio are easily available and distribution is easy. The low level of technical skill needed also means that the process can be inclusive. Listeners without any scientific background have volunteered to help in the production.

Threats: The growing perceived relevance of science in daily life, and the urge to acquire also brings certain threats with it. 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 have great potential in shaping the lives of the people and making their decisions more informative and rational.

The advent of IT and accessible remote learning provides both opportunity and threats for science literacy. In particular, it can enhance the divide between science literates and science illiterate, thus creating potential grounds for conflicts in beliefs and practices. Tis can only be avoided by adopting a science communication policy that is completely inclusive.

Once certain unscrupulous organizations create a client base for science information, it becomes difficult to disengage the public; effective and user-friendly alternatives must be developed early.

Another threat is from deliberate misinformation regarding, or distortion of scientific information for commercial/political gains.

Based on the above analysis, we would like to define the approach and scope of our science communication policy.

Approach, Scope and Exclusions

Approach

Science literacy/science communication is a very broad canvas, and includes many activities. There are also on-going efforts by several agencies and institutions. Our approach, therefore, is to complement and supplement rather than to substitute these efforts.

Primarily, our approach is to Science Communication as an Information Service on Demand to a wide and diverse client base with special emphasis on quality (correctness/authenticity), availability (content base), accessibility and sustainability with an efficient delivery mechanism. Below we discuss the main elements of our Approach:

Identification of the Stakeholders: The stakeholders include both to whom science is communicated, and communicators, the ones who communicate. For inclusive development of science communication, the stakeholders should represent all the relevant sections of the society.

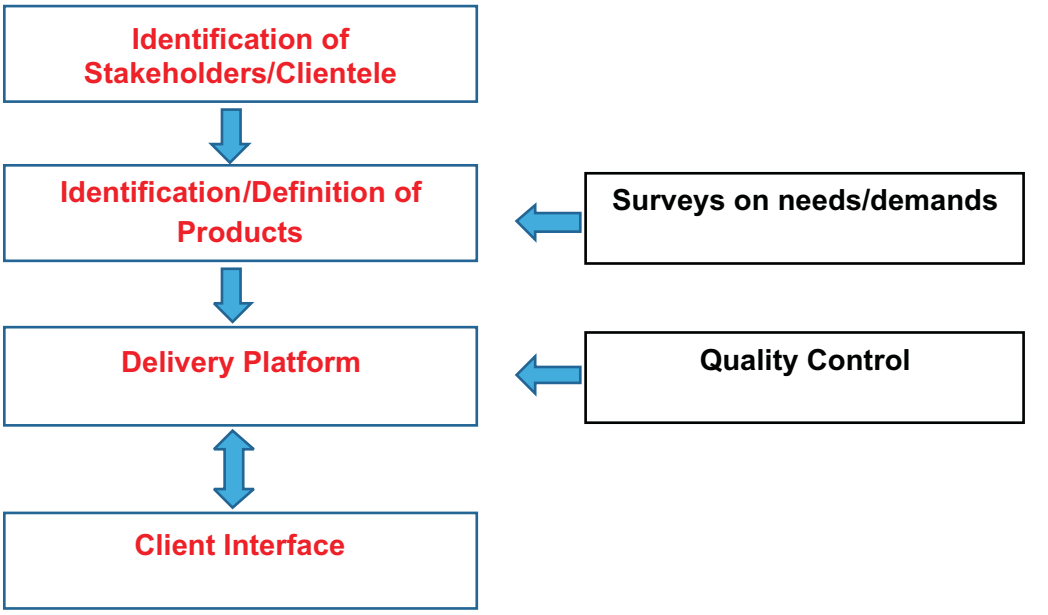
Defining Product: This involves articulation of what to be communicated, for what purpose, at what speed, and with what depth and intensity. The product space should be areas relatively untouched by the other on-going efforts.

Ensuring Quality: The primary requirement of an effective and reliable science communication is the quality of the content. This quality is defined by both accuracy and understandability of the content. The quality parameter depends on the stratum of the client base like students, general public and policy makers.

Ensuring Availability/ Accessibility: As a service, science communication should be available on demand on a wide range of topics at different levels of communication. Mere availability of content in some place is not enough to make science communication effective. To make science communication effective, the product should be easily accessible with easy delivery.

Quality and Sustainability of Service: As a product, science communication should have a long-term plan to make it financially and operationally feasible, if possible financially self-sustainable.

Delivery Platform: Based on the stakeholders and identification of client needs, a delivery platform has to be identified or designed.



A Schematic Representation of the proposed Approach of Science Literacy/Communication

Scope

Science literacy/science communication is a very broad canvas, and includes many activities. There are also on-going efforts by several agencies and institutions. The scope of our policy is therefore to complement and supplement rather than to substitute these efforts.

While there is a clear and urgent need for a science communication policy, there is also a lot of noise of a large and often disparate and contradictory clutter of ideas that may exist in the environment that obstructs formulation of an implementable and effective policy for achieving the desired goals. The purpose of this policy document is to navigate through various issues and views to filter out the critical issues with a conscious focus on the goals and objectives.

Stakeholders: Largely, the policy is aimed at two groups of stakeholders

1. **Beneficiaries (Extreme End-Users)**
   - (a) Children and Students:
   - (b) Public: Illiterate, semi-literate and Literate

(c) Literate but not in science
(d) Science Literate who lack transdisciplinary knowledge.
(e) Bureaucrats and Policy makers including Politicians

2. The Executors of Science Communication

(a) Schools and Colleges and Higher educational institutions.
(b) Non-Governmental Science Organizations
(c) Science journalists
(d) Subject experts including young Researchers
(e) Science communicators

Exclusions from Scope

While we present a broad set of recommendations and the outline of a road map, the details will need to be worked out in a Plan of Action following the adoption and declaration of the Policy Document.

In addition, this Policy document does not consider a few important aspects, not because they are not vitally important, but because there are already established mechanisms for them:

(a) One is that of science education involving issues like science syllabus. It is assumed that science syllabi for different levels have been adopted with due consideration. Thus the policy focuses on how those topics are best communicated.

(b) This policy document also carefully delineates Science Communication from that of Science, Technology and Innovation (STI). While the importance of a carefully prepared STI policy can hardly be overemphasized, it involves a very different set of issues and audience. However, the critical to enabling role of Science Communication for successful implementation of Science Policy issues, is acknowledged and briefly discussed in the document.

(c) Issues related to representation of minorities and women in science are not addressed directly. While these issues are very important, they are more dependent on other policies like recruitment.

Major Conclusions and Recommendations

The following major conclusions emerged from the discussions and the deliberations:

- The society has become increasingly science and technology centric; there is need for clearer, deeper understanding of science by public and various practitioners.
- There is a growing want among public for usable information (like forecasts) among public; however, authentic information is not always available on demand.
- Science communication plays critical to enabling roles in regional and national development
- In the absence of authentic information people fall prey to misinformation, and bad practices
- There is a lack of quality data on science literacy in India, and in Karnataka in particular.
- While there are now several efforts on science dissemination, efforts are required for science literacy with focus on developing scientific attitude and scientific thinking
- A mechanism is needed to ensure quality and authenticity of science information

Based on the above analysis, identified approach and scope, the following major recommendations have been formulated

1. Establishment of an agency for systematic, sustained and structured approach to science communication, which will act as an authentication gateway for information to the clients.
2. Mapping of science literacy and science information demand through inclusive surveys.
3. Development of a complete science communication ecosystem with focus on Karnataka
4. Adopt science communication as an Information Service on Demand (ISoD) in a financially self-sustainable manner, through a Service Provider with clear responsibilities.
5. Adopt clearly defined outcome and measurable targets for effective review and monitoring

Institutional Mechanism

Science communication encompasses many topics as well as several strata of society. Further, the effort has to be sustained, responsive and sustainable. thus, an effective science communication framework requires a robust institutional mechanism.

As science communication encompasses many subjects, the institutional mechanism should be headed/coordinated by a discipline-neutral body (without bias to any subject/discipline).

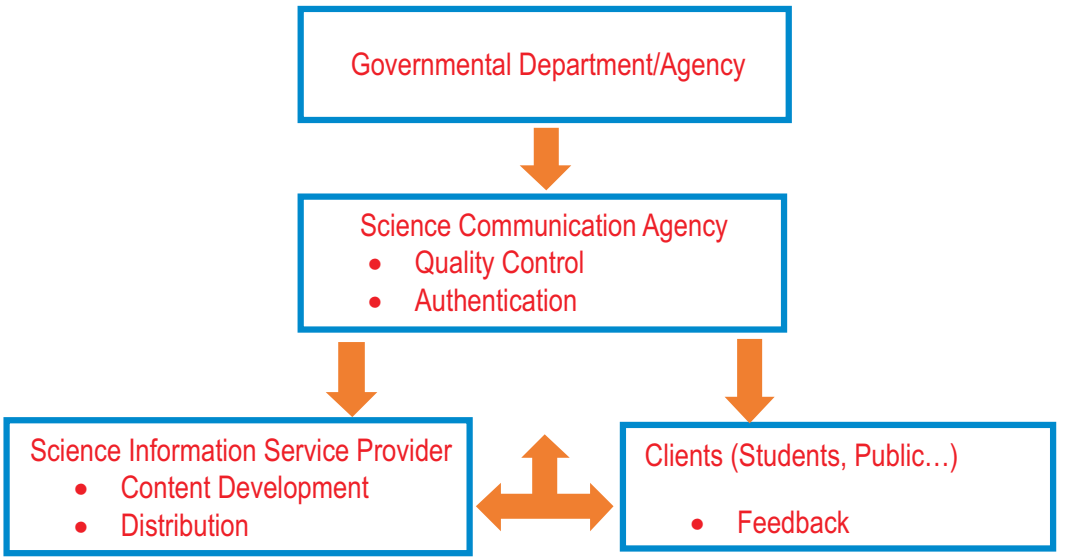
Successful science communication will need to be a responsive service, the institutional mechanism should allow public-private participation for quick, responsive service on demand.

Institutional Mechanism: Broad Institutional Contour

- It should have clear mandate and dedicated resources for a sustained and critical efforts.
- The designated agency should be empowered financially and administratively to identify and engage private parties for Science Communication as a Service.
- There should be regular, periodic surveys for evidence-based measurement of impacts.
- There should be prescribed mechanism for independent review and monitoring and steering.

Science Communication Agency: Major Mandates

- Establish and coordinate a Science Information Service Provider, in resource sharing mode
- Develop and monitor Science Literacy Index for targeted improvement through periodic Survey.
- Create a platform for sustained dialogue between different stakeholders
- Skill development in science communication with Certification for teachers, science communicators and research personnel.
- Development of graduate and postgraduate course on science
- Review, monitoring and steering of Science Communication with a Karnataka Focus.
- Students Science Writing camps with emphasis on Accuracy, Brevity and Clarity (ABC).



Schematic Representation of the proposed Science Communication Structure

Science Communication Service Provider: Major Activities

- Creation of audio-visuals-text content library for different target audience, as recommended by the Steering Committee
- Development and maintenance of an Informatics platform for providing access to science Content Library with easy access
- Upgrade and enhance Science Content Library as directed by the Steering Committee
- Develop and Integrate other Science Communication Services as recommended by the Steering/Review Committee
- Build up a complete ecosystem in science communication, involving different methods and tools based on the client needs, integrating and upgrading digital technologies

Focus on Kannada: While science communication is a generic problem for India, Certain special efforts are needed for creating effective science communication in Karnataka and in Kannada

(a) Identification and prioritization based on evidence on science literacy and user demands

(b) To develop clear and unambiguous terminology/translation in Kannada for scientific terms

(c) Identification and empowerment of scientists who know Kannada language to write in Kannada, along the lines.

(d) Creation of a database of science editors, writers, journalists, columnists, translators, 'scientoonists', illustrators, media-persons, producers, in Kannada

(e) The idea of 'scientific method' in science should be familiarized at the basic level itself. Policy should aim at influencing the Karnataka Text Book Society to response to this need positively. It should also influence the thinking and action of DSERT, to inculcate scientific temper in all the teachers in general, science teachers in particular. KSTA should help both KTBS and DSERT in this challenging task. This needs more discussion.

Review and Monitoring: It is necessary to adopt a dynamic approach in implementing the policy through regular and periodic monitoring as well as review for necessary coordination and course correction taking note of any changes in the environment that may have thrown up new issues. An institutional mechanism should be put in place for internal monitoring and external review.

Major Outcomes, Measurable Impacts and Time frame

Major Outcome Envisaged: The following major outcomes are envisaged from the implementation of the recommendations:

(a) An enhancement in science literacy among students and public

(b) Replacement of superstitious beliefs with rational/scientific explanations

(c) Improved science communication skills, especially among the students and teachers

(d) Higher use of scientific techniques and tools in the society

Measurable Impacts: With the motto that what can be measured can be improved, the following measurable impacts are identified (To be determined through annual surveys for five years):

(a) Increase in the level of science literacy and scientific temper at different levels (surveys)

(b) Reduction in the number of people with irrational beliefs/practices (Based on surveys)

(c) Increase in the number of science writings/events in Kannada

(d) An increase in the level of competitiveness in scientific and related examinations

More measurable impacts can be formulated based on the scope and the design of the survey.

Time frame: A Policy needs adequate time to play out meaningfully in the field; it should not be subjected to frequent and quick changes. Subject to availability of resource and the magnitude of the efforts, this policy assumes a timeframe of about five years to yield significant and measurable results. However, appropriate Monitoring and Review mechanisms should be in place for course correction.

Roadmap: It is recommended that a nodal agency, like KSTA, is entrusted with a mission-mode framework to create a detailed institutional mechanism outlined here.

Perspective

Following the industrial revolution, the level of science communication activities in the western countries increased dramatically. In some ways, India is presently passing through a similar stage. As technology gets more tightly integrated to the socio-economic, the need for scientific information will also increase. Indeed, the socio-economic progress in the coming years will closely depend on the effectiveness of science communication.

At regional level also, science communication can be an important area of collaboration and leadership. There is ample scope for such collaboration in science writing and science journalism; however, the first and the primary requirement for such initiative is a well-organized and carefully calibrated system at home. India could take the initiative in mobilizing like-minded people in South Asia to form Science Writers' and Journalists' Associations in each country, ideally with help from international organizations.

Science communication has to be very audience-specific, from students to public to policy makers. It is desirable that science communication is carried out in local language. However, attempts to communicate complex scientific ideas in regional languages are often counterproductive due to unnatural/artificial translation. A major challenge is to communicate science to various categories of target groups and design suitable platforms according to their respective characteristics.

It is important to choose a judicious combination of dissipation, dialogue and participation. While the dissipation is a basically one way model through print and electronic media, the dialogue model has ample scope for interaction and discussion between Communicator and Communicatees (Class room education, lectures,….). The participative model aims at learning through hands-on exercises. It is clear that none of these models is applicable/effective in all circumstances.

The flow and freedom of information is increasing at a seemingly exponential rate. Accompanying this outflow has been a pleasing growth of public interest in science. However there has also been a radical change in the way such information is valued. A science communication policy needs to take cognizance of changing public perception of science and science information.

At its most aspirational, science communication has the potential to kick start a stronger fusion of public and scientific values, locking our field into the public conscious, thus making science communication an integral part of our lives. Change such as this cannot happen overnight. It would require a radical shift in attitudes towards science communication. At the same time, such a science communication scenario is not unobtainable. Rather, it is more feasible today due to technologies available to connect with the people.

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Annexure 1

Karnataka Science and Technology Academy
(Department of Science & Technology, Govt. of Karnataka)
&
Institute of Frontier Science and Application, Bengaluru

Meeting on 'Science Communication Policy: Focus Karnataka'
14 October, 2020

Proceedings

A meeting on 'Science Communication Policy: Focus Karnataka' was held on 14th October 2020 (Wednesday) from 10.30 am to 4.00 pm. through virtual platform at KSTA office. The Programme and the List of Contributors and Delegates are given in Annexure - 2 and Annexture 3 respectively

Inaugural Session

Prof. S. Ayyappan, Chairman, KSTA, welcomed the guests and delegates to the meeting, with a background note on importance of science in the present scientific world. He outlined the details of the meeting on the “Science Communication Policy: Focus Karnataka”, which was jointly organised by the Karnataka Science and Technology Academy, a Unit of the Department of Science and Technology, Government of Karnataka and Institute of Frontier Science and Application (IFSA), Bengaluru.

Shri T S Nagabharana, President, Karnataka Development Authority (KDA) inaugurated the workshop and in his inaugural address, he stressed the importance of developing scientific temper among common people. He lamented that the science communication in Kannada has been able to reach out to only a small segment of literates. While emphasising the need to increase science literacy, he quoted renowned science writer Carl Sagan, who had said “We've arranged a society based on science and technology, in which nobody understands anything about science and technology and this combustible mixture of ignorance and power, sooner or later, is going to blow up in our faces.” He mentioned that the science literacy should grow with the language. He also said that KDA has brought out a booklet on science literature construction, which will be a useful reference book for aspiring science writers in Kannada. Further, he suggested to organise a workshop on “Science Communication in Kannada” for scientists of various scientific institutions, who can communicate in Kannada, as per the advice of Bharat Ratna Professor CNR Rao and a book could be brought out as an

outcome of the workshop. While concluding his talk, the Chief Guest hoped that the proposed science communication policy will enable to build scientific temper as well as to increase scientific literacy in the State.

Dr. E V Ramana Reddy, IAS, Additional Chief Secretary to Chief Minister and ACST to Government, Department of IT, Bt and S&T could not attend the inaugural session due to official pre-occupation. However, he had conveyed his best wishes for an effective and fruitful workshop.

Dr. Prakash M. Sobarad, Director (Technical), DST/ MD, KSTePs /Member Secretary, KSTA commended the efforts of Dr. Prashant Goswami, Chairman, IFSA & Former Director, CSIR-NISTADS and Convenor in bringing out a comprehensive draft policy on science communication. He expressed that the opinions and suggestions of scientists and science communicators, who were present in the workshop will enable to bring out a unique and comprehensive science communication policy for the State, which could be a model for other States to emulate. Further, he wished that KSTA and KDA could jointly organise more science communication workshops in Kannada in the coming days.

Presentation

Dr. Prashant Goswami, Chairman, IFSA & Former Director, CSIR-NISTADS and Convenor made a detailed presentation on "Science Communication: Focus Karnataka".

Discussions

The above presentation by **Dr. Prashant Goswami** set the platform for opinions, remarks and discussions by the science journalists and communicators, who were present in the meeting. Following are the action points emerged out of the meeting:

1. Popular science articles are to be written without technical jargons with lucid and crisp language to make even a school going students to understand easily. Inform the common people that science is a logical way of life so as to evoke interest in science. While communicating in Kannada, it is not necessary to invent new equivalent terms for English, rather adopt the same.
2. Importance is to be given for aspects that are specific to Karnataka region, especially issues that need scientific solutions, while communicating.
3. Inculcation of scientific temper among common people, especially students should be given main focus both at policy and program levels. Both positive and negative aspects of a scientific progress are to be brought out, with a balanced viewpoint rather than single narrative in articles. Science should be

imparted through Panchatantra like stories to help the reader understand the message easily.

4. Lessons on scientific temper, scientific attitudes and logic are to be included at all levels of learning, while making communication as part of the curriculum. Children are to be taught about the importance of environmental issues and best practices. Also, a suitable platform is to be provided for experiential teaching and learning in science to enrich communication. Further, Student – Scientist interaction program is to be organised with renowned Indian scientists. The issue of digital divide is to be addressed to empower rural people, especially students.
5. Science communication programs like "Turning Point" and "*Vijnana Vismaya*" are to be produced and telecasted in Chandana Vahini channel of Doordarshan and also suitable programs are to be broadcasted through radio stations. It is necessary to make every TV channel to telecast at least half an hour of science program every week, while making effort to start a dedicated science channel in Kannada.
6. Importance should be given for social media tools like WhatsApp, Facebook, Twitter, Instagram and other upcoming tools to bring scientific awareness among general public. However, it is necessary to tackle infodemic of misinformation, disinformation and half-truths by curating the quality of the articles/messages through a suitable gateway. Smart phone is to be used as a modern way of communicating in a bigger way.
7. Science communication should become an important activity of researchers, while giving due recognition to their good effort. Popular science writing skills are to be imparted to the young researchers and efforts are to be made to bridge the divide between scientists and journalists. A continuous dialogue between scientists and common people is to be arranged, whenever new developments in science are happening, while giving emphasis to develop faith in Indian science and scientists.
8. An Indian journal of the quality of Science, PNAS and Nature is to be brought out and also due importance is to be given for starting a good quality journal in Kannada. Articles on critical scientific evaluations of paranormal and fringe-science claims are to be published in Kannada.
9. Corporate Social Responsibility (CSR) and Scientific Social Responsibility (SSR) are to be harnessed for science communication in the State.
10. While encouraging extension programs like "Lab to Land", to take scientific

advancements to the village level, imparting training at the panchayat level on agro-ecology and rural livelihood is necessary. Short video clippings on better practices in agriculture and rural development and awareness articles on proper use of pesticides and herbicides are required. Local specific issues to be documented and scientific methods to tackle them is to be highlighted. Further, local knowledge and wisdom of ecosystem people are to be given due recognition.

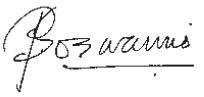
11. It is necessary to organise workshops on scientific advancements to bureaucrats at all levels, while strengthening science communication in Kannada at departmental and institutional levels.
12. Science communication in Kannada is to be made a career option to attract talented youngsters and impetus is to be given for training young students in science communication.
13. Similar to encouragement being given to science communication by NCSTC (National Council for Science and Technology Communication) of Department of Science and Technology., Govt. of India, at the state level Kannada science communication efforts are to be supported.
14. More space for science related news and articles is to be provided in daily newspapers, while science articles are to be vetted by respective domain experts to overcome mistakes in communication.
15. While creating an ecosystem which is inclusive, open and adaptive to science communication, three core subjects like climate change, new technology (Artificial Intelligence) and healthcare are to be given priority in science communication, on the way similar to European countries. Further, best science communication practices elsewhere in the world are to be studied and implemented.
16. Motivation and challenges for science communicators in communicating science are to be systematically studied. It is necessary to make use of omni channel (all available channels) to reach out to a large number of people more effectively.
17. Need to update Kannada science lexicon and establish a common repository called “Kannada Information System” to ensure availability of lexicon and science papers and other related articles in public domain. Requested science communicators to share already available lexicon links, which could be included in the policy paper. Encourage reading of newspapers to improve vocabulary among students.

18. Kannada science writers' directory with classification of their efforts and areas of their interest are to be documented. Kannada Wikipedia is to be strengthened with the contributions from science writers.

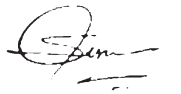
19. Orientation programs are to be organised for science writers to understand what print and electronic media require and importance of timeliness of articles. Further, journalistic orientation to science writers and science orientation to journalists is to be imparted.

20. A google like search engine in Kannada for the use of rural children is required and micro blogging is to be encouraged by creating suitable platform.

Dr. A M Ramesh, CEO, KSTA proposed vote of thanks to the Chair, Dignitaries and Resource Experts, who were present in the VC meeting.



(Prashant Goswami)
Chairman,IFSA



(S Ayyappan)
Chairman, KSTA

Karnataka Science and Technology Academy
(Department of Science & Technology, Govt. of Karnataka)
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Institute of Frontier Science and Application, Bengaluru

Meeting on 'Science Communication Policy: Focus Karnataka'
14 October, 2020

Programme (10.30 AM to 5 PM; Break 1.30 PM - 2 PM)

1.	Introduction of Participants & Welcome Address	:	**Prof. S. Ayyappan,** Chairman, KSTA
2.	Address	:	**Dr E. V. Ramana Reddy,** IAS Addl. Chief Secretary, GoK Electronics, IT, BT, S&T Departments
3.	Address	:	**Dr Prakash M. Sobarad,** Director, DST, GoK;Managing Director, KSTePS & Member Secretary, KSTA
4.	Presentation	:	**Dr Prashant Goswami,** Chairman, IFSA & Former Director, CSIR-NISTADS and Convenor
5.	Remarks by Experts/Delegates		
6.	Remarks by EC Members and Special Invitees, KSTA		
7.	Major Recommendations of the Policy Paper		
8.	Concluding Remarks	:	**Dr Prashant Goswami,** Chairman, IFSA & Former Director, CSIR-NISTADS and Convenor
9.	Vote of thanks	:	**Dr A.M. Ramesh,** CEO, KSTA

Annexure 3

List of Contributors and Delegates

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Lead Presentation			
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